

SCIENCE

FRIDAY, MARCH 1, 1912

NEW PHRENOLOGY¹

CONTENTS

<i>New Phrenology</i> : PROFESSOR SHEPHERD IVORY FRANZ	321
<i>Professorships in China</i>	328
<i>Scientific Notes and News</i>	329
<i>University and Educational News</i>	333
<i>Discussion and Correspondence</i> :—	
<i>The Pribilof Fur-seal Herd</i> : DR. CHARLES H. TOWNSEND, GEORGE ARCHIBALD CLARK. <i>Another View of the Principles of Water-power Development</i> : PROFESSOR J. M. ALDRICH. <i>First Use of the Word "Genotype"</i> : DR. HENRY F. OSBORN	334
<i>Scientific Books</i> :—	
<i>Abel's Paleobiologie der Wirbelthiere</i> : DR. W. D. MATTHEW. <i>East and Hayes on Inheritance in Maize</i> : PROFESSOR L. H. SMITH	341
<i>Notes on Meteorology and Climatology</i> : DR. ANDREW H. PALMER	344
<i>Special Articles</i> :—	
<i>On the Origin of an Albino Race of Deer-mouse</i> : PROFESSOR W. E. CASTLE. <i>Origin of the Sediments and Coloring Matter of the Red Beds of Oklahoma</i> : DR. J. W. BEEDE	346
<i>The Entomological Society of America</i> : PROFESSOR ALEXANDER D. MACGILLIVRAY	350
<i>Societies and Academies</i> :—	
<i>The Academy of Science of St. Louis</i> : PROFESSOR GEORGE T. MOORE. <i>The Anthropological Society of Washington</i> : DR. TRUMAN MICHELSON	354

A HUNDRED years ago, when Gall and Spurzheim published the results of their work, the anatomy of the brain was poorly understood, and the explanations of the relation of its parts, or of the relation of the brain as a whole, to mental states and processes, were interwoven with absurd fancies or with quibbling speculations. There were many guesses postulating definite functions for large areas or divisions of the brain. The assumptions and suppositions were combated and defended mainly by logical methods, and, because of religious and other *a priori* views, direct observation and experimental methods took a subordinate position. What was lacking to make one or another of the various views acceptable was a series or collection of vitalizing facts that could be utilized or adduced in its support. The importance of the cerebellum was magnified by some; it was believed to be the seat of memory, or that of the so-called higher intellectual faculties. The basal ganglia were also thought by others to be concerned with the intellectual processes, whether as the structures or storehouses in which memories were collected or as the element involved in the processes of thought. Even the ventricles had been suspected of being the seat of certain intellectual functions, although it is probable that this view had no direct adherents at the time Gall began his investigations.

The foundation for Gall's work and teaching has been laid by Reil and others

¹ Address by the president of the Southern Society for Philosophy and Psychology, Washington, December 28, 1911.

MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

who had previously taught the supremacy of the brain itself, and who had regretted the lack of knowledge of the anatomy of this important viscus. In support of their views, a few observations could be cited of patients who had lost particular functions, such as sensations, or the ability to move or to speak, when the brain was injured. The associations of these losses with brain injuries had rightly led some to believe that the brain is an organ with diversified functions. Many of the adherents to this view held, however, "that one can not explain the loss of certain intellectual faculties in certain cases except by admitting that the brain is composed of many partial organs," and also that "the smallest parts of the brain have special functions."

Gall, as he remarks in the preface to the work on the "Anatomy and Physiology of the Nervous System," had made numerous observations of the relation of facial, cranial and mental characteristics, and the hypothesis of diversified functions for different brain areas well fitted his own views. This was the origin of physiognomy and of phrenology. The mind, it was supposed, is composed of a collection of units, of mental states or faculties which differ from one another in degree or in kind. It was presumed, therefore, that some localized part of the brain was concerned with each of these supposedly different states and processes, and, consequently, it was believed that it should be possible to find definite brain centers which are associated with, or which produce by their activity, different mental processes. Thus was born a definite conception of centers in the brain for particular mental acts. This conception was naïve and crude, to be sure, but it is the one which has dominated neurology and nervous physiology for the past century,

and which is still to be recognized in present-day teaching and writing.

This view led to various attacks and defences, bombardments and counter attacks, which were usually futile in advancing the knowledge of the relations which were discussed but which were indirectly of the greatest value in the advance toward a better understanding of the relation of clinical phenomena to brain lesions. The discussions led to observations and to careful comparisons of material so that the doctrine of exact localization of centers was not new at the time that Broca startled the neurological world with the report of the relation of a definite brain lesion with the loss of the ability to speak.

The rigid localizations of Gall and the vagaries of Spurzheim and his imitators were not received with entire confidence and faith, but the conception of one function for one part of the brain was too simple and too alluring to be dispensed with. Instead of the general formula that the brain is the organ of mind, divisions were introduced and both the brain and the mind were fractioned. Observations of other aphasic conditions with concomitant cerebral lesions were recorded and the strict localization view continued to be dominant. Wernicke and his disciples stood on the platform with Gall, and discussed learnedly of concept and percept centers and centers for motor images in the cerebral cortex. It was supposed that the recently announced discovery of Fritsch and Hitzig afforded evidence of this for the motor sphere and the precise localization in the cortex of definite centers for sensory processes by various physiologists made many certain that the hypotheses underlying phrenology were correct. All were compelled to admit the principle of cortical cerebral localization, but the meaning of localization proved to be an apple

of discord (*e. g.*, the discussions between Munk, Goltz, *et al.*).

There were some who disputed the functional dismemberment of the brain, and withstood the establishment of spatial localizations for definite mental functions, but their voices were not listened to or their facts were denied, or their arguments disregarded. They contended that the clinical and physiological facts gave no warrant for a localization in parts of the cerebral cortex of mental functions as such, and furthermore they pointed out that the cortical centers did not operate independently, and that functions could not be considered apart from the totality of the elements involved.

The schematism of phrenology was, however, too alluring; it gave a definiteness to diagnosis, and it satisfied certain other practical and theoretical desires. Criticisms of this view from the psychological standpoint were laid aside, but since many of the clinical facts could not be fitted to the anatomical divisions, other evidence was sought. The myelogenetic studies of Flechsig were hailed as witnesses to support the contention of the anatomical localizations of mental processes. The developmental differences of Flechsig's fields (now forty in number) of the cerebral cortex were received with gladness, and were used as additional splints and crutches for the doctrine. But even this was not sufficient. Anatomical localization of the mental faculties could not be made certain without additional support and it is within the past few years that our latest contributions to the doctrine of phrenology have appeared. These may be described in brief as the histological localizations of mental processes.

It was discovered that certain areas of the cerebrum differ both macroscopically and microscopically from other areas, and

the careful examinations of the cerebrum led to the division of the cortex into a number of areas, which were considered by the observers to be quite distinct from one another.

Elliott Smith made a careful examination of the naked eye appearances of all regions of the cerebral cortex and found that the streaks of light and shade differed in parts. The conclusion was drawn that these appearances indicated differences in the arrangement of cells or fibers in the cortex and that the cerebral cortex could, consequently, be divided into these anatomically distinct areas. Campbell and Brodmann used finer methods, those of histology, and discovered that the cerebral cortex could be divided into areas, which had the cells collected in different groups, or which had different sizes of cells, or which had the fibers arranged in characteristic ways. Depending upon the methods which are used, the number of these histologically and macroscopically distinct areas varies from about eighteen to fifty. It does not appear to make much difference that the histologists are not in accord in regard to the number of the histologically distinct areas, or in their exact individual location, the important point appears to be that certain areas are anatomically distinct, sufficiently so, that they may be recognized by their histological and gross appearances.

These areas, because of their differences in structure, are supposed to have different functions. Brodmann has given the clearest pronouncement regarding the supposed functional value of these observations. He has written: "physiologically unlike parts have unlike structure," and "parts of organs which differ structurally must have different functions."

In these statements we have the entering wedge for a more complete phrenology than has been advocated since the time of

Gall. If each of these areas, histologically distinct from one another, has an individual function distinct from the functions of the other areas, we should also have a similar number of mental functions or faculties to correlate with them. Unfortunately for our purpose, the histologists have not attempted to give us the mental correlates of all the anatomically distinct areas, although in a few cases the anatomical reasoning and connections have led to certain psychological suppositions. It is in this way that we must account for the psychic areas of Campbell, and for some of the other psychological localizations which have been made.

An example of this anatomical reasoning is that of Campbell regarding the distribution of the sensory areas. In areas which were believed, because of the physiological and clinical evidence, to have sensory functions, Campbell observed that certain fibers "pursue a curious oblique course" different from other fibers in other neighboring areas. On the basis of this fact Campbell constructed other sensory areas, these latter areas being endowed by him with mental (*i. e.*, sensory) functions because in this one particular they had an appearance similar to that in supposedly known sensory fields. It did not appear to make any difference that these areas might have other well-marked differences. The main anatomical point is that these oblique fibers were discovered in different regions, and the important psychological point is that these minor similarities have been interpreted as indications of similarity of function of a mental order. In this case, Gall has been surpassed, and his phrenological reasoning outstripped.

The designation by Campbell of psychic areas, surrounding the so-called sensory areas, are interpretations of a phrenological nature of a supposed functional con-

nection of the primary receptive areas with these and of a relation of these areas to mental processes. In this there is a distinct psychological interpretation that the nervous impulses which start from the sense organs reach a part of the cerebral cortex and give rise to sensations, and that other nerve currents are sent to neighboring areas and give rise to perceptions.

Let us glance for a moment at the cortical area posterior to the fissure of Rolando. Campbell divided this region into two distinct zones (the postcentral and the intermediate postcentral) which are believed to be concerned with the afferent impulses from the skin and the underlying tissues. The zone bordering on the fissure, the postcentral, Campbell designates as "sensory," and that adjoining the first area "perceptive." In the first area the sensations of touch, of temperature, of pain and of movement are localized, and in the adjoining area (the intermediate postcentral) there are the psychic functions of localization of touches and also the so-called stereognostic sense. If we consider only the postcentral sensory area of Campbell, we might ask: Why should the same brain area be concerned with such unlike sensations as those which he attributes to it? By histological-phrenological reasoning we should have four, or even eight, distinct areas. Even though the gross sense organs have been differentiated, taste and smell, as sensations, are as much alike as are touch and pain and temperature and we might on anatomical grounds, if we closely follow Campbell, expect them to have seats in the same area. The observations of Cushing upon the effects of excitation of the postcentral area in conscious patients have not helped this attempt at a definite mental localization, and, in fact, they are decidedly opposed to it.

The motor area of the brain has been the

easiest for the anatomists to deal with, and it is the one to which they least often impute mental functions. In this connection, however, it is of interest to examine some of the evidence relating to this area to see how well its functions have been determined. In man this area is anterior to the fissure of Rolando, and is not simple. The cortex adjoining the fissure is to be differentiated from another anterior part and to these areas Campbell gives the names precentral and intermediate precentral. The primary part, that bordering upon the fissure, is the precentral, and this, according to Campbell, is bounded anteriorly by the other zone, which is physiologically connected with it. Stimulation of the cortex of the precentral area produces movements, and it has been a simple matter to explain the function by assuming that the cells govern the bodily musculature. But movement is also produced when the intermediate postcentral and other parts of the cortex are stimulated, and the latter movements are the more complex. In the precentral cortex the Betz cells are those to which the motor function has been imputed. These cells differ in number and in size in different parts of the precentral cortex, and these differences have been supposed to indicate functional differences, the use of the larger ones being variously interpreted as (*a*) indication of large movement, (*b*) of the extent of the nerve fiber or (*c*) of the number of muscle fibers which each controls. But differences in the sizes of these cells in the two hemispheres have been observed by Betz, and the larger size of those in the right hemisphere can not be explained in any of the ways that have been suggested. The Betz cells are reported to be absent in the guinea-pig, rabbit and rat, and we have no reason to suppose that these animals lack the ability to move or to coordinate

their movements. The recent studies have not usually been taken to suggest that the motor area is the seat or storehouse of motor memories, and in this respect there is a marked avoidance of a phrenological opportunity. Since the area is one of the most distinct histologically, and since it is one in connection with which extensive clinical and physiological observations have been made, it is of special interest that the histologists have been unable to explain in a satisfactory manner the reasons for the anatomical variations. Here, again, I would interpret the observations of Cushing and others on this area differently from Professor Pillsbury, who concludes that these results point to the non-mental function of this zone. We are not able to limit the localization of mental processes in this way, and, on the other hand, I do not believe that these observations can be interpreted as indications of a mental localization.

There are other facts which must be considered in relation to the localization of supposed mental functions in the motor area. The principal one is the phenomenon of nerve anastomosis. If two motor nerves are cut and the distal part of one be connected with the central part of another, and, conversely, the central part of the first be joined to the distal part of the second, there may be a return of function after a period of paralysis. We have no right to assume any anatomical alteration in the brain connections to account for this change, and the phenomenon has been interpreted, probably correctly, as a transfer of function. If this is to be interpreted in relation to any cerebral mental localization, it must surely be considered negative evidence.

In regard to some of the other so-called sensory fields we have almost as much information as regarding the one supposed

to be concerned with the sensations of touch, pain and temperature. Regarding the localization of mental states in these other areas, we have other suppositions which are to be believed as much as that regarding the mental functions of the post-central area. One of these, that the layers of the cortex in the so-called visuo-sensory sphere function to produce sensations of different color is a more bizarre supposition, and has even less clinical evidence in its support.

Many neurologists and some psychologists appear to believe that we have data which enable us to locate certain definite mental processes in parts of the cerebral cortex outside of the motor and sensory spheres. The disorders of speech, of the nature of aphasia, which are considered by some to be mental abnormalities, are due to localized injuries or destructions of parts of the brain. That the third frontal convolution, the area to which Broca assigned the function of motor speech, has a different structure than the surrounding regions, as has been contended by Brodmann, is a point made in favor of the localization of the speech function in this area. The criticisms of von Monakow and of Marie are, however, too trenchant to be disregarded, and the negative cases which they have cited are sufficient evidence that neither the mental processes connected with motor speech nor the supposed cortical speech mechanisms are definitely located in the part of the brain to which they were assigned by Broca, by Wernicke and by their followers.

One of the histologists has written: "It is unfortunate that we can not say that word deafness is invariably due to a lesion of the left superior temporal gyrus. Authentic cases have been recorded in which there has been no affection of this convolution and these, of course, increase our diffi-

culty in interpreting the condition." In another place he admits that the localization of this condition, even as a clinical phenomenon, rests upon only two cases which have been checked by careful post-mortem examination. Disregarding the number of cases which may properly be cited in support of the localization of this part of the speech function in this part of the cortex, it should be remembered that even one negative case is sufficient to demolish the whole structure of the mental speech function localization.

On the basis of the histological studies, we have also another kind of phrenological localization. This is a localization of particular processes of a mental order in certain layers of cells in the cortex. It will be remembered that the cortex is composed of rather distinct layers of cells with their fibers. Some histologists believe there are six layers, others five. Some of these layers have been disregarded in the formulation of the speculations. Bolton and Ariens Kappers believe that the layers have receptive and associative functions. Bolton disregards the first and fourth layers (he counts only five instead of six, as does Brodmann) and postulates the following functions for the other three layers: for the outer pyramidal layer he assumes a "psychic or associative function," for the third layer a receptive function, and for the fifth layer the function of lower voluntary and instinctive activity.

These facts indicate the general trend of the histological localization of function, and its tendency toward phrenology. What shall we say against this view or what shall be our attitude towards it? Brodmann assumes that the principle of localization has been settled, and all that needs to be done at present is to consider the "how" and "what" of localization. This view can not, however, be accepted.

It is the principle of localization which must be debated and settled. Whether it is the mental processes or cells which are localized is a matter which apparently the histologists and clinicians have not settled. It may be admitted that cells and cell groups are localized, and, although there is some doubt on the part of some clinicians, we may be willing to admit that certain symptoms are produced by definite lesions. We have, however, no evidence which will warrant the conclusion that mental states have been localized, and it is doubtful that many psychologists will believe in the crude histological localization of mental processes. The histological, the physiological and the clinical evidence warrants only a belief in the possibility of an association of brain lesions with motor, sensory and associational derangements, it does not warrant a belief in psychic localization.

Although it is apparent that mental states are not to be found spatially associated with definite areas distinguished from one another by histological and macroscopical characteristics, for practical purposes we must admit a close connection between the brain and mental processes. How then shall we conceive of the relation between the activities of the brain and mental states? The functions of the nervous cells, as functions, may include something which is at the basis of psychological states, but at the present time the physical and chemical activities of the cells can not be believed to be equivalents of the mental processes which may be concomitant with or the result of these activities. Since for practical purposes we may need some general principle of localization, we may say that mental processes are not due to the independent activities of individual parts of the brain, but to the activities of the brain as a whole. Here also I would not omit the cerebellum. It is well known that

similar mental processes may be inhibited by or may be lacking because of lesions in parts of the brain widely separated. This fact is the one at the basis of the diaschisis hypothesis of von Monakow. This hypothesis explains only certain clinical manifestations; it explains certain losses and how the same symptoms may be produced by diverse lesions. Conversely, it helps towards a proper understanding of the brain processes in connection with mental states. The individual parts of the brain do not work independently; they work interdependently, and it is because of the possible functional and anatomical connections that certain types or kinds of mental states are more in evidence than others. We should, on the physiological side, be not far wrong, if we compared the brain to a village or city as did Gregoire of Nice. There are paths and streets, definitely related to one another, but each independent to a certain extent. There are broad roads with many travelers, there are paths only occasionally traversed. There are houses from which the people come and to which they go; some pouring forth people in streams, others only occasionally; to some numerous people go and to others few. What goes on in the houses we can not tell. We can observe the "from" and the "where," the structure of the houses, and numerous other anatomical and histological facts, the effects of blocking of paths and streets and the destruction of houses, but the purposes of the travelers we do not know. We may have for the city a histological and a clinical localization, but this does not mean that we have also a mental localization.

From the anatomical and physiological standpoint, we deal solely with associations of an anatomical and physiological character. With these physiological associations mental processes are supposed to be

correlated. It is not necessary that we shall conclude that all of the mental processes are associational, and we must, in fact, admit that retention, and possibly other factors, in memory are not of this character. What memory means physiologically we do not know; where memories are stored we do not know; and how they are stored we do not know. All that we do know is that certain disturbances of the brain are accompanied by certain mental abnormalities, and that similar mental abnormalities are produced by or accompany diverse lesions. We have no facts which at present will enable us to locate the mental processes in the brain any better than they were located fifty years ago. That the mental processes may be due to cerebral activities we may believe, but with what anatomical elements the individual mental processes may be connected we do not know. Notwithstanding our ignorance, it would appear best and most scientific that we should not adhere to any of the phrenological systems, however scientific they may appear to be on the surface. We should be willing to stand with Brodmann, believing that mind is a function or an attribute of the brain as a whole, or is a concomitant of cerebral operations, but I at least am unwilling to stand with the histological localizationists on the ground of a special mental process for special cerebral areas or for special cerebral cell groups.

SHEPHERD IVORY FRANZ

GOVERNMENT HOSPITAL FOR THE INSANE

PROFESSORSHIPS IN CHINA

WE are requested to state that several teaching positions in the Imperial Pei-Yang University, Tientsin, China, are likely to be open as soon as stable conditions are restored in China. Applications should be sent to President S. H. Wang, Imperial Pei-Yang University, Tientsin. An application should contain: (1) a cable address so that the appli-

cant can be engaged by cable, if necessary, (2) a full statement of qualifications, especially practical and teaching experience, (3) age of applicant and other personal details, so that, in the absence of an interview some idea of the personality of the applicant can be obtained. The Imperial Pei-Yang University is the provincial University for Chih-li (the province which contains Peking), and its position in the educational system of China is similar to that which the state university of a correspondingly important state in the United States would occupy. This does not mean that it is comparable to the University of Wisconsin, for example. The university, founded in 1895 by Dr. Chas. D. Tenney, was destroyed in 1900 and rebuilt in 1902. Its present president is Wang Shoh-lien, a noted Chinese educator and man of affairs, a graduate of Woolwich, England. Of the numerous schools which are eventually to constitute the university only three have yet been organized, Law, Civil Engineering and Mining and Metallurgy. In 1910 the foreign staff consisted of two professors of law, three professors of civil engineering, one professor of mechanical engineering, a professor of history and economics, a professor of chemistry, a professor of mining and geology, and a professor of metallurgy, in addition to a numerous staff of Chinese professors and other officers. The courses of study in these schools are similar to those in American technical schools, but, as can readily be understood, the conditions surrounding the work are somewhat primitive, and make-shifts are often necessary. Nevertheless, Columbia University and the University of California have recognized the completion of the course in this university as equivalent to attaining the B.S. degree. A description of the university and its work can be found in *Engineering News* (one of the numbers during the autumn of 1910). All the work in technical subjects is done in English, though many of the students do not speak English with much ease or fluency. In some respects the equipment is quite complete, and in others it is lacking. The students are at

present comparatively few in number and in many cases their preparation is insufficient, but these disadvantages are being removed. The principal conditions of the contract which the university enters into with its professors provide for a three-year term of service. The salary is paid in silver at the rate of 300 Hongping taels per lunar month (the Hongping tael varies in value according to the rate of exchange, usually 60 cents to 65 cents; there are twelve and one third lunar months in the year). Free medical attendance is provided as well as suitable living quarters; these latter are substantial brick houses, provided with electric light and water. The traveling expenses of the professors to China and return are paid in the event of his completing his contract. The conditions of life in China are so different that it is impossible to convey an accurate idea of them in words. In general it may be said that any one who objects to unfamiliar and, in some respects, crude conditions of life and work would probably not enjoy the life in China, while others will find much of interest and pleasure in it. The cost of living is low, for \$1,500 per year a small family can live in much greater comfort than upon the same sum in America. It will be necessary for the applicant to sail from San Francisco during the first week in July, in order to begin work with the autumn term. More detailed information upon any points in doubt can be obtained by writing to Thos. T. Read, 420 Market Street, San Francisco, but any applicant should immediately send a letter containing the facts (1), (2), (3) to President Wang, stating, if necessary, that he is only tentatively a candidate, until fuller information is available. It must be remembered that the time available will not allow for many exchanges of letters and the final appointing will probably be done by cable. A copy of the application should be sent to Mr. Read.

SCIENTIFIC NOTES AND NEWS

It was proposed on behalf of the Royal Society and the Royal College of Surgeons that Lord Lister should be buried in West-

minster Abbey, and the consent of the dean was obtained. Lord Lister, however, had expressed a wish to be buried in Hampstead Churchyard, where the body of his wife lies. The first part of the funeral service was held in Westminster Abbey on February 16. Only members of the family were present at the interment in Hampstead Churchyard.

At the University of Pennsylvania exercises on Washington's birthday several honorary degrees were conferred, including the doctorate of laws on Dr. William J. Mayo, the surgeon; the doctorate of science on Carl Hering, the electrical engineer, and the doctorate of public hygiene on Dr. A. C. Abbott, professor in the university.

At the stated meeting of the committee on science and the arts of the Franklin Institute held on February 7 Elliott Cresson Medals were awarded as follows: Alexander Graham Bell, Sc.D., Ph.D., LL.D., of Washington, D. C., in recognition of the value of his solution of the problem of the electrical transmission of articulate speech. Samuel Wesley Stratton, D.Eng., Sc.D., of Washington, D.C., in recognition of his distinguished and directive work in physical science and metrology, and its application in the arts and industries. Albert A. Michelson, Sc.D., Ph.D., LL.D., of Chicago, Ill., in recognition of his original and fruitful investigations in the field of physical optics. Alfred Noble, C.E., LL.D., of New York, in recognition of his distinguished achievements in the field of civil engineering. Elihu Thomson, Sc.D., Ph.D., of Swampscott, Mass., in recognition of his leading and distinguished work in the industrial applications of electricity. Edward Williams Morley, Sc.D., Ph.D., LL.D., of West Hartford, Conn., in recognition of his important contributions to chemical science and particularly of his accurate determinations of fundamental magnitudes. Johann Friedrich Adolph von Baeyer, Ph.D., F.M.R.S., of Munich, Germany, in recognition of the many important results of his extended research in organic chemistry and of his discovery of synthetic processes of great industrial value.

Sir William Crookes, D.Sc., LL.D., F.R.S., O.M., of London, England, in recognition of his important discoveries in inorganic and analytical chemistry and of his pioneer work on the discharge of electricity through gases. Sir Henry Enfield Roscoe, Ph.D., LL.D., D.C.L., F.R.S., of London, England, in recognition of his extended and important researches in the domains of inorganic, physical and industrial chemistry.

SINCE Henry Shaw's death, in 1889, over \$400,000 has been paid in special street and sewer taxes and the like, for improvement of unproductive endowment property—two thirds as much has been spent in keeping up the grounds and plant houses and increasing the collection of plants at Shaw's Garden. This burden is now nearly lifted and income from the newly improved property as well as the full return from that which has always been productive is to become rapidly available for very large extensions and increased beautification of the garden. Carrying out the proposed improvements is expected so fully to occupy the time of the director that the trustees and Dr. Trelease, who has acted *ex officio* as a trustee for the last three years, are agreed that this development should be undertaken by a man who is free to give his entire effort to it, while the scientific work that Dr. Trelease has under way or in contemplation is sufficient to call for further freedom of his time from administrative encroachment. For these reasons Dr. Trelease, who has been director of the Missouri Botanical Garden since the death of its founder, in 1889, has asked to be relieved from the responsibilities of the office at the earliest convenience of the trustees, and intends, after this request has been granted, to give his entire time for the present to the completion and publication of a number of research papers on which he is now working, and which will involve study in the herbaria as well as at the St. Louis garden.

DR. GEORGE H. ASHLEY, state geologist of Tennessee, will resign to accept a position with the U. S. Geological Survey as a member

of the land classification board in charge of the coal work.

PROFESSOR MARSTON TAYLOR BOGERT, of Columbia University, has been appointed chairman of the American Commission on Organic Nomenclature, the other members of which are President Ira Remsen, of Johns Hopkins University; Professors W. A. Noyes, of the University of Illinois; T. B. Johnson, of Yale University; J. B. Tingle, of McMaster University; J. F. Norris, of Simmons College; M. Gomberg, of the University of Michigan, and Dr. C. S. Hudson, of the Bureau of Chemistry, U. S. Department of Agriculture. The commission will cooperate with similar national bodies in other countries in the revision of the nomenclature of organic compounds. The chairman will be glad to receive suggestions from American organic chemists.

PROFESSOR P. G. HOLDEN, head of the department of agricultural extension of Iowa State College, has resigned his position to engage in an active campaign for nomination for the governorship of Iowa on the Republican ticket. R. K. Bliss has been made acting head of the department.

DR. H. VON GROTH, professor of mineralogy at Munich, has been elected an honorary member of the London Chemical Society.

DR. F. W. DYSON, F.R.S., has been elected president of the Royal Astronomical Society.

PROFESSOR P. ANDOYER has been elected president of the French Mathematical Society.

PROFESSOR JOHN JOLY, F.R.S., has been appointed Huxley lecturer at Birmingham University for the current session.

DR. J. M. MCBRYDE, former president of the University of South Carolina, later president of the Virginia Polytechnic Institute, and now on the Carnegie Foundation, was awarded the McMaster medal by the University of South Carolina at the celebration of Founder's Day on January 12, 1912. The McMaster medal is awarded annually by the University of South Carolina to an alumnus or former student of the university for "distinguished service to mankind."

PROFESSOR RENÉ ZEILLER, the eminent paleobotanist of the Paris School of Mines and inspector general of mines, has been appointed president of the council general of mines, a public board under the Ministry of Public Works.

DR. W. WILIM, of the St. Petersburg Academy of Science, has been appointed director of the newly-established seismographic observatory at Pulkova.

MR. GEORGE H. CLAPPS has been appointed to represent the Academy of Natural Sciences of Philadelphia on the occasion of the celebration of the one hundredth and twenty-fifth anniversary of the founding of the University of Pittsburgh. The council of the Société Géologique de France has appointed one of the foreign members of the society, Dr. C. R. Eastman, of the Carnegie Museum, to act as official representative of that body at the celebration.

A SMITHSONIAN expedition, under the direction of Mr. H. C. Raven, will start in a few days for eastern Dutch Borneo, where a collection of vertebrates and ethnological material will be made for the United States National Museum.

MR. WALDEMAR T. SCHALLER, chemist and mineralogist of the United States Geological Survey, is soon to leave Washington for a six-months' trip to Europe where he will visit the principal mineral collections and continue his studies at the universities of Heidelberg and Munich.

DR. WARREN D. SMITH, chief of the division of mines, Bureau of Science, Manila, will be on leave in the spring and summer of 1912 in the United States, making visits to the various laboratories in Washington and Pittsburgh. Later he will spend a month in one of the California oil fields investigating the geology and operations there.

PROFESSOR GEORGE D. HUBBARD, head of the department of geology in Oberlin College, is engaged in special research under the Ohio State Geological Survey, in the attempt to formulate some definite conclusions regard-

ing the problems of pre-glacial drainage in the Ohio Valley.

PROFESSOR WILHELM PASZKOWSKI, the director of the Scientific Information Bureau of the University of Berlin, will leave for the United States on March 9, to deliver a series of lectures on German culture on the invitation of the Germanic Society of New York. He is to lecture at Columbia, Harvard, Yale and other universities.

PROFESSOR CASPER RENÉ GREGORY, of the University of Leipzig, is giving a series of lectures at the University of Illinois on "The Development of Science in Germany." Dr. Gregory is the first American-born professor to receive appointment in a German university. He holds the chair of theology at Leipzig.

DR. HAVEN METCALF, of the U. S. Department of Agriculture, delivered on February 17 the John Lewis Russell lecture before the Massachusetts Horticultural Society. His subject was "Fungous Diseases of the Chestnut and Other Trees."

LECTURES have been given before the graduate students in highway engineering at Columbia University by Mr. Clifford Richardson, consulting engineer, New York City, on "Trinidad and Bermudez Asphalts and Their Use in Highway Construction"; by Mr. Nelson P. Lewis, chief engineer, Board of Estimate and Apportionment, New York City, on "Design of Highways and Systems of Highways," and by Mr. A. W. Dow, chemical and consulting paving engineer, New York City, on "The Inspection of Sheet Asphalt Pavements."

PROFESSOR ARTHUR KEITH, curator of the museum, began on February 26 a course of six lectures at the Royal College of Surgeons of England, on phases in the evolution of man.

ON February 24 Sir J. J. Thomson began a course of six lectures at the Royal Institution on "Molecular Physics."

CHARLES ROBERT SANGER, Ph.D., professor of chemistry and director of the chemical laboratory at Harvard University, died on February 25, at the age of fifty-two years.

THE REV. FRANCIS BASHFORTH, distinguished by his experiments in ballistics, formerly professor of applied mathematics at Woolwich, died on February 12, at ninety-three years of age.

M. JACOB AMSLER, corresponding member of the Paris Academy of Sciences in the section of mechanics, has died at the age of eighty-nine years.

THE New York State Civil Service Commission announces among other examinations that of medical superintendent at the Matteawan State Hospital for the Insane at a salary of \$3,000, with maintenance for the superintendent and his family, and of specialist in agricultural education at a salary of \$2,500.

THE Kaiser Wilhelm Foundation for the Advancement of Science has under consideration the establishment of a biological research institution.

MR. W. LEO BULLER has presented to the Dominion Museum, Wellington, New Zealand, a collection of about 700 Maori ethnological specimens which had been collected by his father, Sir Walter Buller.

ACCORDING to a note in *Nature* the possibility of the discovery of a remedy for cancer has been advanced a stage by the preparation of Professor Wassermann, of Berlin, of a substance which possesses a curative action experimentally on cancer of mice. Professor Wassermann reasoned that since the cancer-cells are growing rapidly, their oxygen requirements would be different from, and greater than, those of the cells of the body generally. He sought for some substance which might interfere with the oxygen supply to the cancer-cells, and finally adopted selenium as a means to do this. The next problem was to convey selenium to the cancer-cells by means of the blood stream, and after testing some hundreds of preparations a compound of selenium with an aniline dye eosin was found to fulfil this condition. If the eosin-selenium compound is injected into a healthy mouse it becomes pink all over, but if into a mouse with a cancerous tumor the tumor only becomes colored,

demonstrating the selective absorption of the substance. After two or three injections of the substance into a mouse the subject of cancerous tumors, the tumors are found to have softened, and after six to eight doses they become cystic, diminish in size and finally disappear, and no recurrence takes place. The eosin-selenium compound is, however, poisonous, and a certain number of mice succumb under the treatment. Moreover, only small tumors (up to the size of a cherry) are definitely cured; with larger tumors so much disturbance ensues that the animals die.

THE U. S. Bureau of Education has recently issued Bulletins Numbers 13 and 16 for 1911, the former containing the Report of the American Committees I. and II., on Mathematics in the Elementary Schools of the United States, and the latter containing the Report of the American Committees III. and IV., on Mathematics in the Public and Private Secondary Schools. These reports are prepared under the direction of the American commissioners of the International Commission on the Teaching of Mathematics. They may be secured by addressing the U. S. Commissioner of Education at Washington.

IN commemoration of the seventieth birthday of Professor J. J. Rein, January 27, 1905, the friends of this well-known German geographer instituted a fund, the yearly income of which should be devoted to the furtherance of geographical research. We learn from the *Geographical Journal* that the contributions made then and since to the fund reached, in November last, a total of nearly 9,000 marks, and in the same month the rules for the administration of the fund were drawn up. It is proposed, unless reason to the contrary should arise, to wait until the fund has accumulated to 10,000 marks before making a grant of the interest, which alone is to be expended, the capital remaining intact. Grants will be made with a view to giving young geographers the opportunity of travel and research, and the recipients must be Germans or Japanese, while preference will be given to students in the University of Bonn and in the Commercial College at Cologne. The fund will be admin-

istered by a small committee, on which Professor Rein will serve during his lifetime.

Nature states that the council of the Royal Sanitary Institute offers the Henry Saxon Snell prize for competition this year. The prize was founded to encourage improvements in the construction or adaptation of sanitary appliances, and is to be awarded by the council at intervals of three years, the funds being provided by the legacy left by the late Henry Saxon Snell. The prize will consist of fifty guineas and the silver medal of the institute, and is offered for an essay on "Suggestions for Improvements in the Ventilating, Lighting, Heating and Water Supply Appliances and Fittings for an Operating Room and its Accessory Rooms for a General Hospital of 400 Beds."

THE conference of representatives of forty-two states which was convened last November under the auspices of the International Office of Public Hygiene, and which has been sitting in Paris under the presidency of M. Camille Barrère, the French ambassador in Rome, has now signed a convention making regulations for the prevention of pestilential diseases, especially plague, cholera and yellow fever. This agreement supplements the earlier Paris convention of 1903 in accordance with the latest scientific requirements.

THE annual meeting of the Illinois Society of Engineers and Surveyors for 1912 was held at the University of Illinois on January 17, 18 and 19. The more important engineering topics discussed were stream pollution, sewage disposal, accuracy in surveying, road and pavement problems and the bridge work of the Illinois highway commission. Two illustrated lectures were given, one by Professor I. O. Baker on the Panama Canal, and one by Mr. H. L. Cooper, chief engineer, on the Keokuk Water Power Plant. An afternoon was spent in inspecting the buildings and discussing the work of the College of Engineering.

THE Physical Science Club of Oberlin College is an organization composed of instructors and students in the departments of chemistry and physics, with affiliated members

drawn from the departments of botany and zoology and mathematics. The most recent open meeting of the club was devoted to a lecture by Professor A. W. Menzies, of the University of Chicago, who spoke on "The Uses of Quartz in Physical and Chemical Apparatus." Recent regular meetings of the club have been devoted to talks and illustrated lectures by E. J. Moore, associate professor of physics, who has been for two years working in the laboratories of the University of Chicago under Professor Millikan. Dr. S. R. Williams, head of the department of physics, has read a series of papers on "A Model of the Elementary Magnet," while Professor G. D. Hubbard, head of the department of geology, has brought to the meetings the results of his work under the State Geological Survey, on the investigation of preglacial conditions and present topography in the Ohio Valley.

IN connection with the Centenary Celebration of the Academy of Natural Sciences of Philadelphia, the following invitation has been mailed to correspondents.

The Academy of Natural Sciences of Philadelphia, founded in the year eighteen hundred and twelve for the cultivation of the natural sciences, in March nineteen hundred and twelve will have completed one hundred years of active devotion to this purpose.

For the adequate celebration of its centenary anniversary the Academy will call in convention at its Hall the learned men and institutions of the world—its collaborators.

The Academy has the honor to invite to be present at this event which will take place at Philadelphia on Tuesday, Wednesday and Thursday, the nineteenth, twentieth and twenty-first of March nineteen hundred and twelve.

UNIVERSITY AND EDUCATIONAL NEWS

THE council of Bedford College has announced that the £100,000 required to erect the new buildings at Regent's Park and to inaugurate an endowment fund has now been obtained. Of this amount the London County Council has contributed £30,000.

PROFESSOR HENRY WILLIAMSON HAYNES has bequeathed to the Peabody Museum of Har-

vard University \$1,000 for the library and all his prehistoric and archeological objects, and his books and pamphlets relating to such subjects. To the Boston Society of Natural History is given his fossils, minerals and other objects of natural history. To Harvard College is given, for its classical department, Mr. Haynes's Etruscan, Greek and Roman vases and his ancient coins and medals. The Boston Museum of Fine Arts is to receive his Egyptian antiquities, except those relating to the age of stone in Egypt, which go to the Peabody Museum.

THE dedication of the New York State Education Building will take place on October 15-17. It is expected that educational officers of other states will attend the exercises and that the leading institutions—including libraries and museums as well as universities, colleges and schools—of this and other countries will be represented by delegates.

THE entrance requirement to the College of Medicine of the University of Cincinnati will be advanced to include two premedical years in science, after June 1, 1913.

ANNOUNCEMENT is made that at the University of Pittsburgh instruction in geology, paleontology and physiography will hereafter be given under the direction of the college instead of the School of Mines faculty, courses being offered in the department of geology by the following-named professors and instructors: Drs. C. R. Eastman (chairman), A. E. Ortmann, O. E. Jennings and Messrs. H. N. Eaton and Earl Douglass.

PROFESSOR H. R. SMITH, in charge of the animal husbandry work in the University of Nebraska, and Professor F. H. Stoneburn, professor of poultry husbandry in the Connecticut Agricultural College, have been called to the University of Minnesota.

MR. C. W. HOWARD, of Cornell, known in connection with grasshopper work in South Africa and at present with the Rockefeller Institute, has been appointed to an instructorship in the division of entomology, University of Minnesota. Mr. O. G. Babcock, of College

Park, Maryland, has been appointed as assistant to the entomological division in charge of the insectary. These two appointees take the places of Mr. C. S. Spooner and Mr. H. B. Scammell, respectively. The former goes to Georgia, accepting an offer from the state entomologist there, and the latter has been elected county inspector of nurseries and orchards in Colorado.

DR. B. W. VAN RIPER, of Nebraska Wesleyan University, has been elected assistant professor of philosophy in Boston University.

AT Smith College Elizabeth Kemper Adams has been promoted from associate professor of philosophy and education to professor of education; Aida Agnes Heine, from instructor to associate professor of geology, and Helen Ashurst Choate, from assistant to instructor in botany.

DISCUSSION AND CORRESPONDENCE

THE PRIBILOF FUR SEAL HERD

IN SCIENCE of February 2, 1912, Mr. McLean, of the Campfire Club's Committee on Game Protection, says, among other things about the diminishing fur seal herd, that "the best remedy is to let it absolutely alone."

Nature's methods are wasteful,

So careful of the type she seems,
So careless of the single life.

Civilized countries practise artificial fertilization of fish eggs, and rearing of the fry in hatcheries, because a greater proportion of eggs can be fertilized, and vastly more young brought to maturity, than by nature's methods. The domestication and control of useful animals is universally practised for similar reasons.

That the fur seal tribe would slowly increase if "let absolutely alone" may be true. So would most other beings we are at such pains to cultivate. Pelagic sealing is responsible for the present abnormal condition of the seal herd. The state department's bill for the ratification of the treaty for the suppression of such sealing, *gives the female seals the first chance they have had for twenty-five years*. The fact that we have forty thousand breeding females on the

islands to-day is attributable to our consistently practised rule of keeping down the hordes of dangerous males on land, while pelagic sealers were destroying the female stock.

The Bureau of Fisheries should not be hampered in carrying out its arrangements for a more rapid increase of the herd than nature unaided can effect.

Great Britain, Japan and Russia are to profit by the cessation of pelagic sealing, and ill-advised amendments would render the treaty ineffective, which would be deplorable. A naturalist and a member of the fur-seal investigation commission of 1896-97 for Great Britain, now writes me that

There is no doubt that fighting bulls have caused incalculable injury to the seal rookeries, and judicious killing of the males should be carried on from the date that there is known to be more than a sufficient supply for breeding purposes. There is no doubt that with proper management an increasing number of the surplus males may be killed every year with great advantage to the rookeries.

This is talk from a man who worked with us for several seasons on the Pribilofs.

Are the dozen or more naturalists who have devoted many seasons to studying the fur seal on the Pribilofs, and have long worked for the cessation of pelagic sealing, to be deprived in the end, of the opportunity to put into practice what they believe to be a rational system of fur-seal farming. If congress should be persuaded to let sentimentalists dictate the policy to be pursued on the national seal farm, it would mean a *very slow rehabilitation of the seal herd*. We can not afford to ignore what has been learned about the fur seal by the patient investigations of the past twenty years, and take a step backward.

Last November I had some correspondence with a member of the house of representatives who was taking the agitation of the Campfire Club against the killing of surplus male seals very seriously. I quote the following from a letter I wrote to him at that time:

In order to prevent annual loss of new-born young we must prevent the flooding of the breed-

ing grounds by big *males*. The logical way to do this is to market a large proportion of the three-year-olds, as we always have done, and thus prevent them from growing up into valueless but dangerous and destructive supernumeraries.

I take exception to the line in your letter "unless the herd is further depleted by the Bureau of Fisheries." The *herd* is not to be "depleted," as the females are already saved for fifteen years by the cessation of pelagic sealing, but the polygamous *male part of the herd* must be depleted (to quote your word again) if you propose to mature all your annual crop of infant seals. Nature will do the *depleting* if you don't, and *half the loss will be female pups*.

Surplus bull seals are of no more use than surplus rams or roosters. By saving them you will lose, in fifteen years, not less than \$15,000,000 of revenue.

The present revenue from the islands is over \$400,000 a year, which in fifteen years would amount to \$6,000,000, *without any increase of females*. But the females will increase, and the loss of revenue will exceed \$15,000,000 in fifteen years closed season, and you will lose an important percentage of pups besides.

This is not the first time I have endeavored to prevent well-meaning congressmen from being deceived by the misrepresentations which have been poured upon them for many years. The mischief-maker referred to has bobbed up every other year for the past eighteen years and has been discredited every time. I hope you will look up his record as just published in H. R. Doc. 93, 62d Congress, 1st Session, pp. 1153-62.

The member of the house to whom I sent this letter has at last presented an amendment to the State Department bill in which he proposes to limit the killing of male seals to 5,000 a year for five years, 7,500 a year for the following five years and 10,000 annually for five years after that. At the end of fifteen years new regulations to be adopted.

Now that is better. The gentleman has evidently been thinking it over. We shouldn't probably kill much closer if allowed to have our own way. Perhaps by the time the treaty bill reaches the senate, congress will decide that the Bureau of Fisheries is able to handle the seal fishery safely for the seal herd and for the government.

As to the criticism of my general statement about the *Uncinaria* parasite, I can only reply that our diminished rookeries are *not at present overspreading into the parasite-infected sand areas*. In fact, Mr. Heath states, as quoted by Mr. McLean, "these areas have been abandoned." They must of course be fenced to protect the younger seals from infection as soon as the breeding grounds begin to expand. As to shooting some of the big males when they get too numerous, it would puzzle the experts, as well as Mr. McLean, to say which were the fittest to survive. They all look alike. Old Ocean attends to the matter of selection in the case of the fur seal, weaklings do not survive the seven-month's migration swim among the killer whales of the Pacific. If Mr. McLean will bring his committee to my office where there is a fairly complete set of rookery photographs and charts, he will get a clearer understanding of the Pribilof breeding grounds than he has at present. The fact is that the innocent Camp Fire Club is being used by the unscrupulous lobby which has always been kept at work by the pelagic sealers. One excuse suits it as well as another, this time it is the killing of surplus males. It is a pity that year after year it should succeed in getting the support of men of good standing who happen to be ignorant of the real facts involved.

C. H. TOWNSEND,
Member Advisory Board
Fur Seal Service

TO THE EDITOR OF SCIENCE: In SCIENCE for February 2, Mr. Marshall McLean, member of the Camp Fire Club, enters the list of those who would by indirection ruin the fur seal herd. He would have "natural conditions" rule upon the fur seal islands and "all killing of selected males for commercial purposes . . . cease until the tide of increase in the fur seal herd has once more set toward the flood." He lays down as reason for this the principle "that when any species of wild animal has become so depleted as to be in danger of extinction, the best remedy is to let it absolutely alone."

Singularly enough he quotes President David Starr Jordan in support of his position. The quotation, however, is from an essay on the effects of war, the selection of the most fit for military service and their destruction in war tending to reverse the process of natural selection under which the fittest should survive. The assumption of Mr. McLean is that the killing of fur seals, as practised on the islands, is a selection out of the best, leaving an inferior quality of males to breed. President Jordan would not admit this and is in fact utterly opposed to any scheme for the suspension of land killing as at present conducted.

To do President Jordan justice in the fur seal matter quotation should be made from his reports on this subject which followed the investigations made in 1896-97 under his direction. On page 147 of Vol. 1 of the final report of the Commission, speaking of a *modus vivendi* similar to the one which Mr. McLean would institute, which prevailed in 1891-93, he says:

The suspension of killing on land only released young males to grow up which are now, as idle and superfluous bulls, a menace to the rookeries.

Again, on page 120 of the same volume,

Moreover, the removal of this superfluous male life is not only possible, but it is really beneficial to the herd. The only deaths among the adult bulls and cows, discovered upon the rookeries of the islands, resulted from the struggling of the bulls among themselves or to attain possession of the cows.

In the investigation of 1896-97 a number of eminent scientists from the Smithsonian Institution were associated with President Jordan and a commission of British scientists made a concurrent investigation. These men came together as a joint Conference of Fur Seal Experts in Washington at the close of the investigation and agreed upon a statement of facts regarding the fur seals. The full text of the finding of fact of this Conference will be found on pages 240-244 of Vol. 1 of the final report of the American Commission.

Mr. McLean should read this document. In Article 9 occurs this statement:

The methods of driving and killing practised on the islands, as they have come under our observation during the past two years, call for no criticism or objection. An adequate supply of bulls is present on the rookeries; the number of older bachelors rejected in the drives during the period in question is such as to safeguard in the immediate future a similarly adequate supply; the breeding bulls, females and pups on the breeding rookeries are not disturbed; there is no evidence or sign of impairment, by driving, of the vitality of males; the operations of driving and killing are conducted skillfully and without inhumanity.

In Article 13 it is further stated:

The polygamous habit of the animal, coupled with an equal birthrate of the two sexes, permits a large number of males to be removed with impunity from the herd, while, as with other animals, any similar abstraction of females checks or lessens the herd's increase, or when carried further, brings about an actual diminution of the herd.

Passing to the side of pelagic sealing the Conference of Experts has this to say:

Article 11. Pelagic sealing involves the killing of males and females alike, without discrimination and in proportion as the two sexes coexist in the sea. . . . In 1895 Mr. A. B. Alexander, on behalf of the government of the United States, found 62.3 per cent. of females in the catch of the *Dora Seward* in Bering Sea, and in 1896 Mr. Andrew Halkett, on behalf of the Canadian government, found 84.2 per cent. in the catch of the same schooner in the same sea.

These quotations from the findings of fact of the experts are more guarded than would have been the same statements made by the American Commission alone, but they state with sufficient clearness the effect of land killing and pelagic killing in their relation to the herd. They offer little support to the contention of Mr. McLean.

At the same time President Jordan would recognize that the law of the survival of the fittest applies to the fur seals. The seat of the operation of this law is, however, at sea and not on the land. The fur seals spend the winter in the open ocean. They get all their

food at sea. The difficulty of obtaining food and the buffetings of the severe northern winter constitute the sifting process by which the weak and ineffective fur seal, male or female, is ruthlessly weeded out, leaving only those that are absolutely fit to return to the islands in the spring. The killing gang does not select out the best. They are all alike good. It selects its animals by ages, an animal of three years giving a larger and hence more valuable skin.

But the question at issue is not a theoretical one. For the past fifteen years pelagic sealing has been the recognized sole cause of the decline of the fur seal herd. On July 7 last the United States secured the agreement of Great Britain, Russia and Japan to a treaty for the abolition of this form of sealing. This treaty obligates the United States to pay to Canada and Japan fifteen per cent. each of its land catch, these nations buying off their pelagic sealers. It is only necessary to put this treaty in effect by act of Congress, the Sulzer bill now before the House having this end in view. But opposition to the bill arises. It takes the form of an amendment providing for a "zapooseka" or close season of fifteen years, coincident with the term of the treaty, in which there shall be no land sealing. That is, the government is to have no land catch to share with the cooperating nations. They will become dissatisfied, withdraw from the treaty, and pelagic sealing will be resumed. Such is the inevitable trend of this misguided effort to which the Camp Fire Club is wittingly or unwittingly lending itself.

The principle laid down by Mr. McLean may apply to pairing animals like the deer, bear, duck or quail. But the fur seal is a polygamous animal and has nothing in common with these wild creatures. Its true analogies are with the domestic animals—cattle, horses, sheep, poultry—which man handles for his comfort or profit and from which he regularly removes the superfluous males without damage to the breeding stock. Would Mr. McLean have us believe that the way to recuperate a herd of cattle that had fallen into decline

through the illicit killing of its cows and calves was to leave it absolutely alone? A cattle man would stop the killing of the females and young, would look out for a reserve of bulls, and market his steers as usual. Especially would he do this if it were necessary for him to pay for the cooperation of his neighbors in suppressing the illicit killing.

Mr. McLean would have us take a different course. He would have the government begin by depriving itself of an immediate income of about \$400,000. The herd has probably yielded this amount in the lowest year of its existence. This income has possibilities of indefinite increase with the recovering herd. But there would be no increase. With no quota to share with the cooperating nations the treaty would lapse. Pelagic sealing would be resumed. The herd would continue on its way to extinction. Is this what Mr. McLean and the Camp Fire Club want?

GEORGE ARCHIBALD CLARK

STANFORD UNIVERSITY, CALIF.,

February 7, 1912

ANOTHER VIEW OF THE PRINCIPLES OF WATER-
POWER DEVELOPMENT

IN SCIENCE of December 15 the foremost place is given to Dr. W J McGee's statement of the above-mentioned principles. As the subject is one of general scientific interest, I beg leave to present it from a different point of view.

A couple of centuries of legislation, following decade by decade the settlement of the country and the appropriation and use of its waters for power, irrigation, etc., have left little scope for the application of Dr. McGee's principles, at least on the part of the federal government. He writes as if he were laying out plans for a continent not yet occupied by human beings. It may as well be recognized that in the older part of the United States the more desirable water powers have all passed completely into private ownership. The practical application of his principles, if there be any, must then be in the newer, and chiefly the western, part of the United States. But

even here irrigation waters are already appropriated very generally except in those not rare cases where a large capital is required for the first installation. Water-power can not be dissociated from the subject of irrigation in the west, because the same water often serves both purposes, and may even be taken away from one to serve the other. It is surprising to see all through the west that every spot where irrigation can be cheaply applied to good soil has been farmed with the aid of water for many years. Many cases have come under my observation, from forty to a hundred miles from a railroad, where irrigation has been practised for thirty or forty years, generally up to the limit of the water supply or of the good land. It is very late in the day to talk about the general principles which should govern the framing of laws on irrigation, but it is astounding to read (McGee's principles 34 and 36) that legislation at present should be tentative and experimental. Every western state has voluminous laws on the subject, and ten times more voluminous legal decisions on those laws. The general principle has had full acceptance for a long time that the states have complete authority over the use of waters within their respective borders except for the purpose of navigation and in a few unusual cases. While there is a "borderland" here that is not worked out, there is no reason to suppose that the general control of its own irrigation waters by the state will be materially impaired.

This control necessarily extends to the public lands within the state. In nearly every case where the settler puts in a small irrigation system for his own use, his head-gate and the most of his ditch are on government land, since he has to go some distance above his own land to get the fall requisite. A later homesteader above him can not disturb his ditches, even though occupying a tract across which they run. This policy runs back almost beyond history, and is as well settled as anything can be.

Turning now to the subject of water-power, we find that all the western states have pro-

vided definite methods by which it may be appropriated, as in the case of irrigation waters. Even on public lands the authority of the state has until lately not been questioned. But with the rise of the conservation movement there has come about a demand that the federal government assert a right to the disposal of water-powers on public land, and especially in national forests. This demand has its origin in the belief that the western states are allowing the water-powers to be monopolized, and are in danger of losing all right of subsequent regulation, so that the public served by the power will be compelled to pay "all that the traffic will bear."

In the absence of any explicit law or precedent for federal interference with water for power or irrigation, the proponents of the policy have grasped at general constitutional powers, such as "to promote the general welfare," or the right to control navigation in rivers and internal waters. President Taft a year ago favored the assertion of a claim to the banks of the stream by the federal government, so that the *site* would become paramount to the *water* in a power installation, conceding that the state had exclusive jurisdiction over the latter; the interposition of a technical claim to the stream banks would, in his opinion, operate to prevent the establishment of any power plants without federal approval, even though the government had no claim on the water. This admittedly technical and strained position is just about paralleled by his proposal that, since we have solemnly pledged our word to other nations that we will make the tolls in the Panama Canal equal to all, we will make some sort of a subsequent gift to our own vessels to equal the fees paid by them. The good intention we all concede, but lament the facile readiness to "beat the devil about the stump."

This is not the place for an adequate discussion of the safeguards which the western states have placed around the disposal of water power, nor for a description of the propaganda by which, largely through misrepresentation, many people have been made to believe that

only in federal control could there be any assurance of permanent management in the interest of the people. Enough to mention that fundamental safeguards are two—*forfeiture for non-use*, and the *reservation of regulatory powers by the state*. Both of these are embodied in the constitution of Idaho.

But the most notable principle enunciated by Dr. McGee is his No. 30. It is as follows:

30. The essential principle of natural equity on which specific legislation may rest has already found expression, both by statesmen and by powerful associations of citizens including both jurists and publicists, in the incontrovertible proposition—now become axiomatic—that *all the water belongs to all the people*.

So far is this principle from being true, either legally, equitably, or even as an ideal relation, that the reasonableness of the opposite view will appear immediately on stating it. If Dr. McGee is correct, then the general government should collect as a tax on every water power the full value of the power above a reasonable interest on the cost of installation; from every user of irrigation water it should collect the difference in value between what will grow with water and without it, minus the cost of applying the water; from every municipality a tax on its use of water; even from the owner of a well a proportionate assessment. Otherwise the people as a whole can not derive the benefit which their ownership of all the water ought to entitle them to. A closer analysis would necessitate even a farther extension of water taxation, for it is obviously unjust to tax the western user of irrigating water while the eastern farmer is allowed the free use of rain-water. Such are the absurdities into which we are led if we admit the principle that all the water belongs to all the people.

Is it possible to express in a simple way the correct principle as to ownership of water? Not in all relations, because of their variety. But some are unquestioned: a man owns the water in his well, we all believe; he has a right to the benefit of what falls from the sky on his land; communities rightly own the water that flows through their mains to their citi-

zens. So far all agree that the present legal relations could not be improved; they are substantially ideal.

How about water for irrigation? Prior use is the determining element in ownership, according to the laws in all the western states, and continuity of use is the element which perpetuates the title. This is the simplest possible plan, and taken all in all is the most feasible one, and works as little hardship as any.

Now about water for power. This is the "nub" of the whole matter for the conservationist, and is probably all that Dr. McGee had in mind in enunciating his principle, which seems so fundamental to him as to be "axiomatic," "incontrovertible," and even (principle 38) "a part of the body of ethical conviction underlying American character and constituting its strength." In the face of these overwhelming assertions, I will undertake to maintain that the people as a whole have no interest whatever in any specific water power. A portion of the people are in each case interested, those who are in a position to make a reasonable use of the benefits of the power, but the rest have no right whatever to claim a share by taxing those more favorably situated with reference to this particular power site. To illustrate: the Snake River in southern Idaho has several large falls, principal among them being Shoshone Falls, with Twin Falls second. These have been partially developed, and a large amount of power, light and heat can be obtained from the present installation. Now what part of the people of the United States are equitably interested in what is being done here? Simply those who live within the range of power transmission, and are not more accessible to another source of power. These people, in a very real sense, have an interest in that water power, and have a right to be protected from extortion by the laws of the state, and as a matter of fact they have a recourse in the constitution of Idaho. But the people of Cape Cod, or of Washington, D. C., have no equity in Shoshone Falls, and no right to expect dividends from its successful development. This is not

only ideally sound in principle, but it is recognized in law and embedded in the whole organization of state and nation.

Differences of opinion in regard to policies of conservation have had their origin very largely in loose and vague thinking such as is illustrated by Dr. McGee's principles. Not realizing that the west has been facing these problems for decades, and has pretty nearly settled them, a class of theorists in the east has taken up the same subjects *de novo*, treating them as if they had never before been touched by the hand of man and the way were free for any sort of plan to be carried out.¹ I do not accuse all conservationists of being so visionary, but Dr. McGee represents something of an element. It wears the patience of the people of the west to be obliged to deal with such persons, who have a missionary zeal to teach us things we have always known, and know much better than the would-be teachers, and who would view us as either a set of thieves and robbers or helpless children whom they would protect. Our best reliance is ourselves; we are amply clothed with authority to do all that is necessary; our experience and training have familiarized us with the work ahead; and our purpose is to protect the interests of the public, our own public, ourselves, in all necessary and reasonable ways.

J. M. ALDRICH

FIRST USE OF WORD "GENOTYPE"

I HAVE recently asked Dr. J. A. Allen, the leading authority in this country on nomen-

¹A beautiful illustration, which I will not charge to Dr. McGee, is in the withdrawal of power sites from entry under the public land laws. It was a great relief to many eastern conservationists when sweeping withdrawals of this class were made a few years ago; but in fact under the laws of Idaho the acquisition of a water power is a process entirely apart from the filing of any sort of entry on land, and the withdrawal did not change the legal status of the power sites by one iota. The mode of acquisition of water power under the laws of the state is precisely the same as before, and I doubt not that the same is true in other western states.

clature, to express an opinion upon the first use of the word "genotype." He writes, January 30, as follows:

I can not give the date of the first introduction of this word to replace the phrase "generic type," but I find it was used as early as 1903, as apparently a word not new. By 1905 it was in common use in discussions of generic types and prior to 1910 it became officially adopted by the International Zoological Commission. I think the first use of the word was by some writer in *Nature* or in the *Annals and Magazine of Natural History*.

The word is derived from the Greek word γένος = kind, genus and τύπος = type. The use of "o" as a connecting vowel seems to be consistent with general usage in such cases. The derivation of "genetic" is given in the Century Dictionary as from γένεσις = generation, genesis.

I will try to trace it to its origin, and, if successful, report again on the subject.

This note by Dr. Allen raises the question as to the use of "o" as the connecting vowel in the term "genotype" proposed by Johannsen. Why not use "e" as the connecting vowel, as in genetic, genesis, etc.? This would obviate the confusion which is bound to arise and persist if the preoccupied term "genotype" is adhered to. It is such a valuable conception of Professor Johannsen's that it seems worth while to have a permanent and undisputed designation for it.

HENRY FAIRFIELD OSBORN

AMERICAN MUSEUM,
February 7, 1912

SCIENTIFIC BOOKS

Grundzuge der Paläobiologie der Wirbelthiere.

By O. ABEL, Professor of Paleontology in the University of Vienna. Stuttgart, E. Schweizerbart. 1912. Pp. xii + 708, frontispiece and 470 text illustrations.

This extremely interesting and highly important treatise is in effect a text-book of adaptation among the vertebrates past and present. The subject is, as Doctor Abel observes, the most recent development of paleontologic science. Speculations, indeed, on the habits and environment of extinct animals are as old as the first finding of their fossil re-

main. But the systematic study of the subject, analysis of the adaptive characters of living animals and interpretation of the adaptation of extinct animals, is a development of the last few years. It requires as its groundwork thorough morphologic study of complete skeletons, which until recent years have been very rarely available among fossils.

The subject is a fascinating one—somewhat speculative in the present stage of its development, for the criteria of adaptation are not yet perfectly worked out or thoroughly tested. But it lends to these dry bones a living interest that a systematic treatment lacks, and a faunal or even a phylogenetic treatment imperfectly supplies. Doctor Abel has given particular attention to this phase of paleontology and his work is authoritative, especially in the field of marine adaptations. The subject is clearly presented and well illustrated.

The volume opens with a sketch of the development of paleontologic method. Then follows a discussion of the causes, conditions and processes of fossilization. The principal portion is devoted to the various adaptations of vertebrates, especially of fossil vertebrates as interpreted by modern adaptations, and a full discussion of the criteria of adaptation in external form and in construction of feet, teeth and other parts. A final chapter discusses the relations of paleobiology and phylogeny.

The analyses of the various adaptive types with their parallel and divergent characters are admirably clear and serve to bring together the latest results of studies in *ethology*, as the study of adaptation is called by Dollo. The illustrations are numerous, well chosen and instructive.

The entire volume is surprisingly free from errors of fact—such criticisms as may be made are in matters of interpretation and theory. Doctor Abel is perhaps a little prone at times to accept the theoretical conclusions of others without sufficient critical sifting of the evidence, and here and there one finds difficulties in reconciling conclusions which in truth are based upon mutually exclusive data.

The volume is crowded with novel sugges-

tions and interpretations of adaptation of various extinct races. Most of them will be welcomed and accepted; some may need further consideration; a few seem open to serious criticism. The discussion of the carnassial teeth of carnivora ignores their most essential feature, the shearing adaptation. The hypothesis that the inner digit of the fore foot in amphibia is primarily absent, and its presence in reptilia and mammalia is a "neuerwerbung," will not commend itself to many; nor will the interpretation of the Stegocephalia and Cotylosauria as fossorial adaptations be readily reconciled with the strikingly paddle-like construction of the feet in these animals, especially the former. But these and a few other points are occasional lapses from the normally high standard of thorough and up-to-date information and good judgment. The book will rank as one of the most important and readable contributions to paleontologic literature, and be indispensable to every one who wishes to understand and teach the real meaning of extinct animals and their relations to the world in which they lived.

W. D. MATTHEW

Inheritance in Maize. By E. M. EAST and H. K. HAYES.

This is an interesting and important contribution from the Bussey Institution of Harvard University, which has appeared as Bulletin 167 of the Connecticut Agricultural Experiment Station. It presents a very thorough study from the Mendelian standpoint of a number of characters of the Indian corn plant and their method of transmission. The interest in this study, however, is by no means confined to its connection with the improvement of this, our greatest agricultural crop, for many of the principles involved have a significant bearing upon several of the more general problems of heredity.

The bulletin, embracing as it does so many different considerations, scarcely admits of a summary that would be short and at the same time intelligible. It is the present purpose, therefore, merely to indicate the general plan and scope of the work by mentioning briefly a

few of the many interesting points touched upon.

After a short introduction in which the authors point out the advantages and disadvantages offered by the maize plant as material for study of genetics, the subject is conveniently divided into five parts.

In Part I. is presented the *material and the problem*, and the corn plant, *Zea mays*, is considered in its systematic relationships. Different classifications are considered, but the well-known one of Sturtevant, slightly modified, is finally adopted as being the most practical and convenient. In this connection there is some speculation in regard to the origin of maize based upon the facts brought out in the investigation concerning the transmission of its characters. After reviewing briefly some of the theories proposed by other authors the suggestion is here offered that maize is derived from teosinte or some similar plant. The maize ear represents an evolutionary product derived by progressive meristic variation of the central spike of the lateral tassels of the teosinte. Other changes are to be accounted for in the accession or dropping of characters, the transmission being in accordance with Mendel's principles.

Mention is then made of the work of previous investigators of inheritance in maize. It is interesting to note how very close some of these workers were, in the days of the eighties and nineties, to the rediscovery of Mendel's law, yet failed to recognize its operation in their results. It is also interesting to note that *Zea mays* is the plant that furnished the data which finally did lead to the rediscovery of the law on the part of both de Vries and Correns.

Next follows a catalogue description in detail of each of the twenty-nine ears of corn that formed the parentage of the various hybrid combinations used in this investigation. Experimental methods and precautions are described. Very much of the value of this report depends upon the painstaking care with which the investigation was carried out, as for example, the previous inbreeding of all the stock used, in order to establish purity. An-

other tremendous advantage is gained by going to the trouble of making separate pedigree cultures of the various lines, thus admitting an analysis of results, such as was sometimes impossible in the case of the work of previous investigators in this field.

Part II. deals with *endosperm characters*, and under this subject is taken up first the transmission of starchiness of endosperm. Although the behavior of this character as to dominance and segregation is already known, the matter is made the subject of an unusually thorough and critical study here because of the sharpness and completeness with which starchiness segregates and with the idea of applying this study to some fundamental principles in their connection with Mendelism, such as prepotency and gametic purity. In all the large number of cases examined the behavior in this respect is found to be so regular as to force the conclusion that "the mechanism by which the members of an allelomorph pair are distributed among the gametes is accurate," and none of the extra explanations offered by some other investigators to account for discrepancies are needed here.

In connection with the transmission of yellow and non-yellow endosperm, an important principle is brought out; namely, that in certain strains of corn yellowness is not a simple unit, but rather is the result of two distinct and independent yellow units or factors operating to give precisely a di-hybrid effect. This is an important observation, in that the same principle may be carried to various other characters supposed to be simple, but which in reality may prove, upon more critical analysis, to be compound, depending upon the operation of a series of units or factors.

The transmission of endosperm colors has been left rather vague by the experiments of previous investigators in this field. Some of the discrepancies in the results of Correns and of Lock with respect to the behavior of purple aleurone colors are now explained by the present investigation; thanks to the separate pedigree culture making possible a more thorough analysis of data. It is found that the

behavior in this regard is not always constant, but varies in different strains or families, apparently depending upon the constitution of the uniting gametes. The conception of certain developer and inhibitor factors serves to explain quite satisfactorily most of these cases, and it is believed that when all of the facts are known, most, if not all, of these discrepancies and contradictions will be similarly explained, and thus will be wiped out some more of the seeming exceptions to the law of Mendel.

Part III. is a discussion of *Xenia* and the observations here are in the main in accord with those of previous investigators. On account of the various effects of dominance in different cases some confusion has arisen concerning this phenomenon. An explanation of these cases is given in connection with which the following law regarding *Xenia* is formulated:

"When two races differ in a single visible endosperm character in which dominance is complete, *Xenia* occurs only when the dominant parent is the male; when they differ in a single visible endosperm character in which dominance is incomplete or in two characters both of which are necessary for the development of the visible difference, *Xenia* occurs when either is the male."

In Part IV. is considered the inheritance of a number of *plant characters*. In the case of the podded kernel the presence of pods is found to be a perfect dominant. In the investigation of pericarp colors a number of different kinds of reds are distinguished. Red in cob color was found to behave as a simple character in the cases examined, but red color in silks appears to be more complex in its inheritance.

A section is devoted to the matter of *physical transformation of starchiness*, and a study of the crosses between soft starchy and corneous starchy sort brings out the following three facts: "The characters that give the flint or the dent appearance to maize are transmitted as plant characters to the entire ear and not as endosperm characters to the individual seed. They conform to the essen-

tial feature of Mendelism by showing segregation; and they are due to the action of more than one transmissible character."

A discussion of *size characters* is next taken up, including observations on numbers of rows of kernels on ear, height of plant, length of ear and size of seed. Studies of these characters are naturally beset with complications, the results being often obscured by the influence of environmental effects. However, the experiments disclosed segregation with respect to these characters, and the conclusion is therefore drawn that size characters do mendelize. Perhaps the most important point in this connection is the suggestion that in such cases which have heretofore ordinarily been considered as continuous variations, we may actually have to do with a series of Mendelian factors in operation, naturally quite difficultly discernible on account of the complex polyhybrid ratios involved, the absence of dominance, and the obscuring effect of environmental influences.

Part V. contains an account of a number of interesting *abnormalities* which arose among these various cultures. The appearance of several dwarf plants is described, but their significance is rather obscure, since no ratios were obtained. Bifurcated ears transmitted this abnormality as a dominant. In the case of striped foliage arising as though by mutation in some of these strains, the striped plants are considered to be heterozygous.

Aside from the interesting content of the bulletin, the authors are to be congratulated on its general appearance and make up. It is well illustrated by 25 plates of excellent photographic reproductions. The data are well chosen and presented in very convenient arrangement.

L. H. SMITH

NOTES ON METEOROLOGY AND CLIMATOLOGY

THE MOST NORTHERLY SCIENTIFIC INSTITUTION

THE weather observatory recently established by the Norwegian Meteorological Institute at Spitzbergen, 1,100 miles north of Christiania, is the most northerly permanent scientific institution of any kind in the world.

Meteorological data are communicated to the central office by means of wireless telegraphy *via* Green Harbor. The progress made at the observatory may be watched with interest, as it is hoped that the data there obtained will aid in European weather forecasting. The Norwegian project is separate and distinct from the German expedition, headed by Drs. Wagner and Rempp, which is now carrying on research in aerology and geophysics in Spitzbergen.

THE ANNUAL REPORT OF LINDENBERG OBSERVATORY

THE report of the Royal Prussian Aeronautical Observatory at Lindenberg for the year 1910 has recently appeared. As has been the case during several years preceding, upper-air investigations were conducted daily, without a single exception, throughout the year. The meteorograph was elevated by means of kites 459 times, and by means of captive balloons 211 times, the average height with the former method being 9,866 feet, and with the latter 9,898 feet, both of which are higher than the corresponding averages for any earlier year. Of 29 registering balloons sent up 27 were recovered, and the average height attained was 49,028 feet (9.3 miles). On August 20 the greatest height yet reached at Lindenberg was recorded, the barograph indicating a height of 82,138 feet (15.6 miles). 177 pilot balloons carrying no recording instruments were also sent up during the year, data of wind velocity and direction aloft being obtained from these ascensions. In addition to the aerological data, which are printed in detail, the report contains five papers prepared by various members of the observatory staff.

WATER VAPOR IN THE ATMOSPHERE

IN observations with a telescope, bolometer or pyr heliometer the approximate amount of water vapor in the atmosphere is an important factor. The determination of this amount by spectroscopic methods is not very satisfactory. In order to simplify the evaluation of this factor Professor W. J. Humphreys has examined the data obtained in 74 balloon flights made on cloudless days. Conditions on

cloudless days alone were considered, since in practical work a knowledge of the moisture content is needed only upon such days. The data used pertain to Europe alone, but presumably are fairly representative of conditions everywhere, since they cover the observations of several years and were obtained at many different places. Though the amount and the distribution of the water vapor in the atmosphere varies greatly from day to day and from place to place, it is interesting to learn that there is a tendency toward a maximum of humidity just above one of the levels of maximum cloudiness, the cumulus level. While there were no clouds at this or any other level at the times of observation, the water vapor was relatively abundant there, and, though not dense enough to produce a cloud, was made manifest by the readings of the hygrometer. Among the conclusions stated by Professor Humphreys (*Bulletin of the Mount Weather Observatory*, Vol. 4, Part 3) are the following:

The amount of water vapor per unit volume decreases with elevation in an approximate geometric ratio, and the thickness of the water layer that would result from a condensation of all the water vapor in the atmosphere above any given level, whatever the season, so long as cloudless days are used, may be approximately expressed by the equation, $d = 2w$, in which d is the depth of the water layer in millimeters and w the weight in grams of the water vapor per cubic meter at the given level or place of observation. An alternate, and probably equally good expression, is, $d = 2e$, in which d , as before, is the depth of the water layer in millimeters, and e the partial pressure of the water vapor in millimeters of mercury.

Professor J. Hann had previously concluded, from observations made upon all kinds of days, regardless of cloud, that $d = 2.3e$, or about 15 per cent. greater than the value now found for clear days.

NEW BOOKS

AMONG the books which have recently appeared are: (1) "Thermodynamik der Atmosphäre," by Dr. Alfred Wegener. Leipzig, J. A. Barth, 1911. 8°. 331 pp. (2) "Aeronautische Meteorologie," Teil II., by Dr.

Franz Linke. Frankfurt a. M., F. B. Aufarth, 1911. 8°. 126 pp. (3) "Climatic Control," by L. C. W. Bonacina. London, Adam and Charles Black, 1911. 8°. 167 pp. (4) "Studie über Licht und Luft des Hochgebirges," by Dr. C. Dorno. Braunschweig, F. Vieweg & Sohn, 1911. f°. 153 pp. (5) "Dynamic Meteorology and Hydrography," Part II., Kinematics, by V. Bjerknes and different collaborators. Washington, Carnegie Institution of Washington, 1911. 4°. 175 pp. (6) "The Clouds and Fogs of San Francisco," by Alexander McAdie. San Francisco, A. M. Robertson, 1912. 8°. 106 pp.

EXCESSIVE PRECIPITATION

DURING the month of July last, Luzon, the largest of the Philippine Islands, was visited by three typhoons accompanied by rains which are among the heaviest on record anywhere upon the earth. The precipitation accompanying the first typhoon was greatest at Baguio, the summer capital and official health resort of the islands. The rainfall there, as registered by an automatic gauge of standard design, was as follows: 14th, 34.64 inches; 15th, 28.88 inches; 16th, 16.73 inches; 17th, 7.89 inches—a total of 88.14 inches in four days. (The mean annual rainfall for New York City is 45 inches.) The second storm was severest at Bolinao, where 26.69 inches of rain fell during July 20 to 27, inclusive. With the third typhoon, that of July 30 to August 2, inclusive, 23.80 inches fell at Candon, while Baguio received an additional 20.14 inches. Naturally the floods following these unprecedented downpours did enormous damage. The \$2,000,000 military road stretching for 52 miles over the mountains between Dagupan and Baguio was seriously damaged. It had previously been forecasted that this road, regarded as one of the engineering feats of the islands, would remain "until the Pyramids crumbled." The rainfall at Baguio during the four consecutive days of the first storm has rarely been exceeded anywhere in recent times. The only records of greater amounts for a similar period are: (1) 101.84 inches at Cherrapunji, India, June 12 to 15,

inclusive, 1876, and (2) 96.50 inches at Silver Hill, Jamaica, in November, 1909. The Indian station, located upon the Himalayan slopes, near the Bay of Bengal, remains the wettest spot on the globe. It is reported that during one month, August, the rainfall measured 384 inches, and it is believed that the annual precipitation is over 600 inches.

A NEW WEATHER SIGNAL

SINCE December 1 a new marine signal consisting of a red pennant has been displayed by the United States Weather Bureau to signify the approach of high winds which would not justify the issue of the regular storm warning. It is known as the "small craft warning," as it is designed especially for the owners of fishing, towing, motor and yachting craft. The pennant is flown from the officially designated flagstaffs on the Atlantic, Pacific and Gulf coasts, as well as along the borders of the Great Lakes. Judging from recent press reports the innovation is proving of value to those for whom it was intended.

CONCERNING AVIATION FATALITIES

AMONG the suggestions which have been offered to explain various fatal accidents in aviation recently is that which one aviator describes as "ethereal asphyxia, a dreadful something which lurks in the upper air and creeps irresistibly upon the senses of the aviator, lulling him into a dreamy unconsciousness." He declared that it was not due to rarefied atmosphere, as there was no stifling, choking or pain in the ear-drums, such as often results from decreased pressure. The falsity of the explanation is apparent to any one who considers the matter, for aeronauts have, for more than a century, ascended to far greater heights than the aeroplane has yet reached, and no "mysterious gas" has been reported. Soundings of the free air have established the fact that up to the greatest height attained by an aeroplane, about two miles, the composition of the atmosphere is sensibly the same as at the ground. However, some of the fatalities occurring can not be explained by mechanical defects, gusts of

wind, or "air-holes." Might not the "ethereal asphyxia" be similar to the drowsiness experienced by certain people in windy weather? Persons who have climbed to the summits of high hills or mountains often express a desire to lie down and sleep. Moreover, the cold aloft is another factor to be considered. One traveling in a balloon experiences a perfect calm about him and thus is not greatly affected by the low temperatures. But every one who has sat in the front seat of a rapidly moving automobile on which there was no wind-shield can readily imagine how chilling must be the air encountered by an aviator traveling against the wind. Even in mid-summer temperatures below freezing are met at a height of two miles, and such air, brushing past the aviator at a rate of a mile a minute, might soon cause temporary paralysis of the limbs, resulting in a loss of control of the craft. The heaviest clothing yet worn by an aviator could hardly give him the protection needed. Accelerated heart-action, nervous tension, fatigue and other factors doubtless contribute to the aviator's distress. The problem is not wholly a meteorological one.

ANDREW H. PALMER

BLUE HILL OBSERVATORY,
February 1, 1912

SPECIAL ARTICLES

ON THE ORIGIN OF AN ALBINO RACE OF DEER-MOUSE

THE first case of Mendelian inheritance shown to exist among animals was that of total albinism in mice. In this condition the fur is snow-white and the eyes are pink, they like the fur being entirely devoid of skin-pigment. For the pink color of the eyes is due to the blood seen through the transparent eye; it disappears at death.

The ordinary white mouse is an albino variety of the common house mouse, with which it crosses readily. Cross-bred offspring (F_1) are never white, but like the wild parent in color. But in the next generation (F_2), part of the offspring are albinos. On the average one fourth are albinos, and these breed true in accordance with Mendel's law.

The time and place of origin of the common white mouse is entirely unknown; the same is true of nearly all distinct varieties of animals either domesticated or wild. Peculiar interest therefore attaches to a case in which an albino race has arisen from a wild species. Such a case I will now briefly describe.

The native field mouse of North America is known by several different common names, such as deer mouse, field mouse, white-footed mouse and wood mouse. Systematic zoologists at the present time give it the generic name *Peromyscus*. The most recent and exhaustive study of this genus is that of Osgood¹ (1909), who, after examining over 27,000 specimens from all the great collections of America and all other available sources, "conservatively" recognizes 157 distinct species and subspecies.

In the light of this exhaustive study it seems probable that *Peromyscus* is the most abundant and the most widely distributed of North American mammals, as well as one of the most carefully studied from the systematic standpoint. Nevertheless an albino specimen has never up to the present time been reported, which would seem to indicate that its occurrence is very rare.

In the fall of 1909, Mr. K. S. Clark caught in the woods near St. Johns, Clinton County, Michigan, a pure white albino *Peromyscus*. This he kept alive for some weeks and then delivered it to Professor Walter B. Barrows, of the Michigan Agricultural College, where Mr. Clark was a student. Fortunately neither Mr. Clark nor Professor Barrows obeyed the common impulse straightway to make a museum specimen of the rare individual. They tended this unique animal with great care. Later through the kindly interest of Professor W. M. Barrows, of Ohio State University, who was engaged with me in breeding experiments with *Peromyscus*, the albino was sent to me. I received it in Feb-

ruary, 1911, and kept it alive at my house or at the Bussey Institution until January 29, 1912, when it died probably from extreme cold.

In March, 1911, Mr. Clark trapped a dozen other *Peromyscus* near the place where he had caught the albino the previous fall, and sent these to me. All were normal in appearance and referable to *Peromyscus leucopus noveboracensis* Fischer, as described by Osgood. Two of the females were successfully mated with the albino which proved to be a male. During the summer and fall of 1911 they produced 6 litters of young including 28 individuals, all normal in appearance like the mothers. One of the daughters was mated with the albino father in October, 1911. On November 21 she bore a litter of three young, an albino and two ordinary young, but all were eaten the following night. Three weeks later she bore a litter of four young, two being albinos and two normal. The albinos were successfully reared, but no more young have since been born, and as this species does not breed in winter it is not probable that more will be obtained for some months.

The behavior of the albino variation thus far is that of a simple Mendelian recessive, as in house mice, guinea-pigs, rabbits and rats. The experiment has not yet progressed far enough to show whether the albino variation has been attended by variation in any other pigment factor, and so its continuation is awaited with interest. In the other rodents mentioned we have not only albino varieties, but also black ones (lacking a ticking or "agouti" factor), in all except rats yellow ones (with a reduced amount of black), and in mice and guinea-pigs brown ones (lacking black entirely). As nothing is known concerning the origin of these variations, it is uncertain whether they arose simultaneously with the albino variation, or as a consequence of it, or wholly independently of it. As, however, we find the inheritance of these variations to be wholly independent of the inheritance of albinism, it seems probable that in origin also these variations were independent. A case in which observation along these lines is possible is heartily welcomed.

¹ Osgood, Wilfred H., "Revision of the Mice of the American Genus *Peromyscus*," Publication of U. S. Department of Agriculture, Bureau of Biological Survey, N. A. Fauna, No. 28, 285 pp., 8 pls., Washington, 1909.

Men who make a business of producing plant novelties, Burbank, for example, are delighted with the slightest indication of sporting, because they consider that, the "stability of the type" having been disturbed, other variations are likely to follow.

Whether there is any basis of fact for this idea cases like that here described may tend to show, if carefully followed up. If the supposed phenomenon is found to be a real one and an initial color variation is frequently followed by others, then it will remain to discover an explanation, since "instability of type" can scarcely be regarded as an explanation, but only a figurative statement, of a phenomenon observed.

Studies of the inheritance of albinism, as already stated, show it to be independent in transmission of the several factors which determine the particular character of the pigmentation, as gray, black, yellow, etc. For in crosses with colored varieties, albinos actually do transmit to their offspring particular qualities of pigmentation, as gray, black, yellow, etc. It is assumed, therefore, that in the albino variation something has been lost from the organism which is indispensable to the production of pigment, though it has nothing to do with controlling the particular sort of pigment which the organism can form. Albinos, therefore, can be produced of as many different sorts as regards their breeding capacity, as are the visibly different pigmented sorts. Each pigmented sort finds its counterpart among albinos, though all these albinos may look alike. A study of the progeny of an albino through two generations will serve to show with what particular colored variety it corresponds. Such a study has not yet been completed for the albino *Peromyscus*.

The albino variation, being a *loss* variation and recessive in nature, must have existed in both the gametes (the egg and the sperm) which produced the individual captured by Mr. Clark. Both the parents of that individual, accordingly, *transmitted* albinism and probably produced other albino young, if they had more than a single litter of offspring. But the survival of albino offspring in the wild

state would be exceedingly doubtful because of their conspicuousness and their defective vision. Yet the heterozygous brothers and sisters of the albino sports should themselves be at no disadvantage in the struggle for existence and should produce about 25 per cent. of albino young. Therefore we should not be surprised if the sporadic occurrence of albinism should continue in a locality where it has once made its appearance, as in Clinton County, Michigan. The naturalists of that region would perform a service to science by looking for and reporting future occurrences of albinism in field mice there.

In conclusion I wish to express my gratitude to Professor Barrows (father and son) for entrusting to me the experimental study of this interesting variation.

W. E. CASTLE

LABORATORY OF GENETICS,
BUSSEY INSTITUTION,
FOREST HILLS, MASS.,
February 7, 1912

ORIGIN OF THE SEDIMENTS AND COLORING MATTER OF THE RED BEDS OF OKLAHOMA¹

SINCE the origin of the sediments and the red coloration of the Oklahoma red beds has long been the object of more than ordinary curiosity, it may not be out of place to briefly outline some of the results of a recent study of these deposits.

Previous workers have made known the fact that the light-colored sediments of the lower Permian rocks of Kansas become red in Oklahoma, and that the similar light-colored Albany beds of Texas redden on approaching Oklahoma. In the Texas reports Cummins hinted that a lateral transition of the Albany beds into the red rocks of the Wichita formation might not be impossible. Later he worked out this transition in detail.² Gould and

¹Published with the permission of the director of the Oklahoma Geological Survey.

²The leading recent articles bearing upon this subject are: Cummins, *Trans. Tex. Acad. Sci.*, for 1897, pp. 93-98. Gould, *Kans. Univ. Quart.*, pp. 175-177, 1900; *Amer. Jour. Sci.*, XI, pp. 185-190, 1900; *Trans. Kans. Acad. Sci.*, XVII, pp. 179-181, 1901. Adams, *Amer. Jour. Sci.*, XII, pp.

Adams first described the transition of the light-colored sediments of Kansas into the red deposits of Oklahoma and Adams made a reconnaissance in Texas. Later, Kirk traced the Wreford limestone into a red sandstone in Oklahoma. Beede suggested that the sediments of the red beds were derived from the Arbuckle-Wichita Mountain region, and Gordon made further studies of the Texas region.

During the past summer the attempt was made to take up the study of this transition in somewhat greater detail in order to discover more fully its nature and significance. The horizons of the rocks lying between the Neva limestone and the Wreford limestone, as represented in Kansas, and a part of the way, the Fort Riley limestone were studied. A trip to the Wichita Mountains was made to study the relation of the red beds to the Permian conglomerates. With the exception of a single reference this paper deals with the strata of the beds studied.

In tracing the limestones and shales of the basal Permian beds of Kansas southward into Oklahoma the relationship of the light-colored sediments to the red sandstones, red shales and red limestones of Oklahoma is clearly revealed. It is shown that some of the heavier ledges of limestone first become sandy along their outcrops in patches a few rods across. Farther south the sandstone areas increase in size until the limestone appears only in local areas in the sandstones and is finally wanting. Traced farther southward, the sandstones become deep red or brown with local areas of white. The decimation of the fauna sets in as the limestones diminish and the remains of life are not found far beyond the limits of the limestones. The shales become red very much farther north than do the sandstones, and are frequently more deeply colored. Some of the lower limestones become red before they change into sandstones. The sandstone ledges continue for some distance southward

as rather even, uniform beds, but farther on they are found to thicken and thin in a somewhat systematic manner.

Several ledges of sandstone frequently occur in a single section and where one of these ledges is found thickened the others are apt to be thicker than normal. Likewise they are all found to be thin over certain areas. The regions of thickening and thinning were found to be parallel belts lying north and south at right angles to the major drainage lines. Two of these belts together with an intervening region about eight miles across were studied. The sandstones thicken at the expense of the shales, sometimes eliminating them. In one instance a thin limestone was traced southwest into one of these zones. A sandstone twenty feet or more beneath the limestone thickens and rises above the limestone and practically unites with the sandstone some distance above it. The limestone seems to die out a few feet from the sandstone, but farther west the latter shrinks to its normal thickness and the limestone is present in its proper position with its usual characteristics.

In these zones of thickening which are frequently several miles wide, the sandstones are very irregularly cross-bedded and frequently ripple-marked, while the thickening is uneven. It would seem that these zones are opposite the mouths of streams which brought sediment into the sea, where the coarser materials were carried farther from the shore than opposite the inter-stream spaces. The irregular thickening of the individual beds may be due to current work, wave action and heaping into local dunes by the wind, though the action of the last factor is uncertain. The irregular bedding and ripple marks indicate a sort of littoral or very shoal condition for the deposition of the sandstones and shales.

As this interesting transition of sediments is traced still farther southward, we find, before reaching the latitude of Shawnee, that the sandstones become more abundant over the whole area, more lenticular, more irregularly cross-bedded and imperfectly lithified. In a single railroad cutting a thick lens of

383-386, 1901; *SCIENCE*, XV., pp. 545-546; XVI., p. 1029, 1902; *Bull. Geol. Soc. Amer.*, pp. 191-200, 1903. Beede, *Jour. Geol.*, XVII., pp. 710-729, 1909. Gordon, *Jour. Geol.*, XIX., pp. 110-125. Kirk, Third Bienn. Rep. Okla. (Terr.) Geol. Surv.

sandstone may fade into a soft sandy clay shale with the same bedding and structure as the stone itself and change back into a sandstone a few rods away. Most of the sandstones are so incoherent when freshly quarried that pieces two or three inches in diameter crush readily under foot. In many of the wells of the region the water is obtained in "quicksand." Most of the shales contain much fine sand and offer little resistance to weathering.

At their southern limit these red sandstones and shales are found to dovetail into the Permian conglomerates on the northern side of the Arbuckle mountains, while similar conditions obtain among the higher beds farther west where similar conglomerates occur on the flanks of the Wichita mountains. These conglomerates are largely composed of the fragments of the pre-Carboniferous limestones aggregating 8,000 or 10,000 feet in thickness flanking the mountains and at one time covering them. The solution of these limestones produces a red clay wherever the insoluble residue happens to remain undisturbed below the vegetable mold, and the disintegrating limestone conglomerates produce a more or less sandy red clay indistinguishable from some of the red bed sediments. Thus it seems not improbable that much of the material of the red beds in the region studied was derived from these thick limestones.

Considering all these phenomena, it is apparent that the transition of deposits from the Arbuckle mountains to the Kansas line is such as would be expected in passing from the mountains out into a shallow epicontinental sea.

That the solution of limestone produces red residual clays is well known. It is exhibited in the residual soils and clays of the limestone regions of the unglaciated part of the Mississippi Valley, Cuba, southern Europe and elsewhere. The clays thus derived and their coloring matter—the red oxides of iron—are minutely divided and when in suspension settle slowly, but little movement of the water being sufficient to keep them in suspension. This characteristic adapts them to

long transportation. The great thickness of the Arbuckle and associated limestones, and their former extent, over thousands of square miles of country where they are now removed or represented only by their upturned edges surrounding the mountains, seem to furnish an ample source of the coloring matter and a considerable amount of the clays of these lower Oklahoma red beds. The Gabbros, red granites and red porphyries of the Arbuckle-Wichita region also contributed their share of sediment to the red beds.

From these observations it would appear that the sediments of the lower red beds of Oklahoma were derived largely from the Arbuckle-Wichita Permian land mass and the coloring matter mainly from the solution of the limestones known to have been removed from it. It also seems probable that the sediments of the region studied, especially those some distance from the mountains, were deposited in very shallow turbulent water, or vast tidal beaches, inimical to life of all kinds, since they are void of fossils or even carbonaceous matter.

J. W. BEEDE

THE ENTOMOLOGICAL SOCIETY OF AMERICA

THE sixth annual meeting of the Entomological Society of America was held at Washington, D. C., Tuesday and Wednesday, December 26 and 27, in room 376 of the new U. S. National Museum building. The following papers were presented:

HERBERT OSBORN: *Faunistic Studies in Entomology.*

The need of an extended and accurate record of insect fauna is urged, with statement of instances where such data have been much needed. Attention is called to the possibilities for widely scattered workers to assist in such studies and the desirability of some connected plan by which to encourage and bring together the results of such studies. A suggestion is made that the society appoint a permanent committee on faunistics, the duty of which will be to devise means for the encouragement of faunistic studies and to bring together the correlated results in this line with reports to the society as to methods proposed and the results secured.

E. P. FELT: *Numerals as Aids in Classification.*

The habitual use of numbers in catalogues indicates utility. A modified system of decimal notation is adapted to the needs of naturalists, while additions require little change. A general agreement upon the numbers for the major zoological division is suggested prior to the application of the system by cataloguers and other general workers.

E. S. TUCKER: *Studies of Insects Bred and Collected from the American Mistletoe.* Presented by Andrew Rutherford.

By the name of "American mistletoe," the species *Phoradendron flavescens* Nuttall and its several varieties is meant. Two snout-beetles belonging to the same group as the cotton-boll weevil were bred from terminal enlargements of the stem. From the larvæ of one of these beetles five hymenopterous parasites were bred, all of which attack the larvæ of the cotton boll-weevil. About sixty species in all were obtained.

H. C. SEVERIN: *The Influence of Temperature on the Moulting of the Walking-stick, Diaphanera femorata.* Read by title.

R. MATHESON and C. R. CROSBY: *Notes on Aquatic Hymenoptera.* Illustrated. Presented by C. R. Crosby.

Three species of aquatic hymenopterous egg parasites have been reared at Ithaca, N. Y.: (1) a trichogrammid from the eggs of a damselfly (*Ischnura* sp.); (2) a proctotrupid from the eggs of a water strider (*Gerris* sp.); (3) a mymarid from the eggs of a back swimmer (*Notonecta* sp.). All of these forms are able to swim actively under water by means of their wings. They are also able to use their wings for flight in the air.

ANNA H. MORGAN: *Photographs Illustrating the Life Histories of May-flies.* Illustrated.

Photographs were shown which illustrated the life history and biology of about twenty-five May-flies. Both nymphs and adults were photographed alive; the nymphs in a solution of chloretone, the adults without anæsthetic. Nymphs representing the main biological groups were shown and their habitat described. Imagoes and subimagoes of certain genera were shown and their structure and characteristic postures noted.

H. Y. TSOU: *The Chinese Wax-scale, Ericerus pe-la.* Illustrated.

One of the most beneficial insects of the family Coccidæ has been domesticated by the ancients of the Chinese people for the wax which it produces. This paper consists of (a) correction of errors of

European translations from Chinese works; (b) additional statements on the life history of the insect; (c) method of propagating this insect; (d) division of labor in carrying on this industry among the people of different localities, so that the eggs of the insect are produced in the northern district and the wax in the southern district; (e) importance of this industry; and (f) use of the wax.

A. D. MACGILLIVRAY: *The Lacinia in the Maxilla of the Hymenoptera.* Illustrated.

The Maxilla of *Macroxyela*, one of the most generalized of Hymenoptera, has the lacinia well developed. The lacinia among the wasps is a well-marked, triangular lobe attached to the distal and mesal end of the stipes. The maxilla of the Apoidea is greatly elongated for sucking, the galea enlarged and the lacinia reduced. The lacinia is a rounded lobe fringed with setæ and occupying the same position as it does in *Vespa*. It is not wanting or united with the galea in the honey-bee, as is usually stated in text-books and works upon apiculture.

LUCY WRIGHT SMITH: *Glycogen in Insects, especially in the Nervous System and the Eyes.* Illustrated.

In a heterogeneous lot of insects, including representatives of seven orders, glycogen has been found: (1) in immature and adult stages (a) in the crystalline cells of compound eyes, (b) in the crystalline and retinal cells of simple eyes, (c) in the neurilemma; (2) in immature stages only, (a) in the cells of ganglia in all parts of the body. No glycogen has been found in nerve fibers.

J. A. NELSON: *Note on an Abnormal Queen Bee.* Illustrated.

This queen was originally sent from Grand Bay, B. W. I. When received she was alive and quite active. It was planned to introduce her into a hive to test her fertility, but she died by accident before this was done. The dead queen appeared normal in structure with the exception of the abdomen, which was ovoid in shape, instead of conical as in the normal queen; it was also flexed strongly ventrad at the apex, which had consequently a blunt appearance, like that of the abdomen of the drone. The sternites of the 5th and 6th abdominal segments were unusually broad and somewhat asymmetrical, as was also the sternite of the 4th segment. The sternite of the 7th segment was the most modified of all, being greatly shortened in the longitudinal axis, and almost concealed by the sternite of the preceding segment.

The notch on its posterior border was abnormally broad and deep. The sting had a slight kink midway of its length.

The internal organs were apparently normal with the exception of the genital organs. The left ovary and oviduct were entirely wanting. The right oviduct and ovary were present, but the latter appeared to possess only a single egg tube. The spermatheca was empty. The bursa copulatrix was also shortened in the longitudinal axis, so that the external openings of the spermatheca and the poison glands were brought close together. No characters suggestive of hermaphroditism were found. The cause of the abnormalities is unknown.

J. CHESTER BRADLEY: *The Designation of the Venation of the Hymenopterous Wing*. Illustrated.

In the higher Hymenoptera, owing to certain remarkable conditions that prevail, the full application of the Comstock-Needham system of venation becomes a very complex matter. This is especially true in the case of the hind wings. By certain simple abbreviations this complexity is avoided, and the system becomes quite conveniently usable for taxonomic purposes.

ANN H. MORGAN: *Homologies in the Wing-veins of May-flies*. Illustrated.

The main tracheæ of May-flies precede and constantly mark the course of the main veins. The costal and subcostal tracheæ are simple, as are the veins which follow them. The radial trachea (except in one form) and the vein which follows it are unbranched. The radial sector is very probably present in May-flies, but in an unusual position between the veins M_1 and M_2 . It is detached from radius as in the dragon-flies and stranded upon M_1 . The medial vein has its characteristic four branches. This interpretation involves important changes in the nomenclature of radius and media.

A. D. MACGILLIVRAY: *The Pupal Wings of Hepialus thule*. Illustrated.

The adult wings of *Hepialus* are very similar to the hypothetical type of Comstock and Needham. The pupal wings show several features wanting in the adult wing. There is a two-branched subcosta, the first branch of subcosta disappearing and the subcosta of the Lepidoptera is therefore Sc_2 . The radial and medial tracheæ enter the wing through the same vein, the media together with a cross-vein forming the arcus between radius and cubitus. The presence of an arcus has not been reported in the Lepidoptera hitherto.

J. CHESTER BRADLEY: *The Wing Venation of Chalcid Flies*. Illustrated.

The hymenopterous family Chalcididae present a uniform excessive reduction in the number of their wing veins which is approached elsewhere in the Hymenoptera only by certain Proctotrypidæ and Evaniidæ. This depletion is the result of a degenerative tendency that is manifest wherever there is considerable reduction in the size of the wasp. It is of interest to ascertain with what veins of other Hymenoptera the vein remnants in the Chalcid wing are homologous.

The so-called marginal vein is in reality the elongated stigma, the "post-marginal" is r and R_1 and usually bears on its anterior margin a spur of the base of R_3 .

Leucospis is our most generalized group of Chalcididae so far as its wings are concerned. The wings of Chalcididae show a close relation to those of Cynipidæ, through *Leucospis* in the one group and *Ibalia* in the other.

F. M. WEBSTER: *Our Present Educational System in Relation to the Training of Economic Entomologists*.

The demand for trained men capable of engaging in entomological work has increased greatly, but the graduates of the colleges generally are not equipped for such work and must have a special training of one to two years before they are available. The author wishes to emphasize the necessity for training in related sciences, in modern languages, and especially in field observation in entomology. The student intending to be an entomologist should begin in his first year with field observations and should be required to gather his own material for study. It would be especially desirable that students training for entomological work should have an experience at least during their vacations in work in some experiment station, and this sort of work should very properly be given credit in the college or university as part of the requirements leading to a degree.

C. W. JOHNSON: *The Use of Color in Designating Types and Varieties*.

Colored labels for types is being carried to an extreme. At the last meeting of the Cambridge Entomological Club one of our members who makes a specialty of printing labels for entomologists, asked me "what is an allotype, a homotype, a metatype, an autotype and a topotype, and why don't they use the same color for the same kind of a type? One wants his paratype on light

green, another on pink and a third on brown. Why I can't get enough colors to go around." An energetic collector with time and money at his disposal can make some sort of type out of seventy-five per cent. of his species. These various types may have some value, but they can not always be depended upon. A great number of colors used indiscriminately is very confusing, for there are equally important features that might be designated by color, aside from manufactured types. Colors could be used to advantage to indicate abnormalities, especially to-day when the experimental biologist is after data as to the number and kinds of abnormalities that occur in specimens in nature. Such specimens are completely overlooked unless they are marked in some way. Not more than two colors should be used for types: red for the primary, and green for supplementary types. Then another color, yellow, for instance, could be used for abnormalities.

HERBERT OSBORN: *A Problem in the Flight of Insects.*

Insect flight has been explained continuously by the movements of the wings vertically, the rigid anterior border with flexible hinder portion of the wing serving to so relate itself to the atmosphere as to furnish a forward movement. While this explains readily the forward progression, it does not in itself explain the hovering or the backward flight of many insects which is a matter of common observation. Numerous instances cited illustrate this feature. The explanation suggested for this movement is that the wings are rotated forward until the flexible under-portion of the wing reacts upon the atmosphere in such manner as to maintain the insect in a stationary attitude or even to propel it in a backward direction. Such rotation may be seen to be amply provided for in the structure of wings and the close observation of insects in hovering indicates the forward rotation.

E. P. FELT: *The Biology of Miastor and Oligarces.*

The widely distributed *Miastor* larvæ reproduce by pedogenesis in the moist, decaying bark of various trees during fall and spring, midges appearing from June till August. A larval generation occupies three to three and a half weeks. *Oligarces* is less common than *Miastor*. Both are subject to attack by a number of natural enemies.

LEONARD HASEMAN: *Entomological Work in Missouri.*

Since the early masterly work of Dr. C. V. Riley the entomological needs of Missouri have not been

properly served. Every line of entomological work is open for study. This department is investigating the more urgent insect problems of Missouri, though it is much handicapped by lack of assistance. The work connected with the instruction, station, nursery inspection and duties of state entomologist is more than the present staff can properly handle.

W. L. W. FIELD: *Hybrid Butterflies of the Genus Basilarchia.*

Since the Boston meeting two years ago, considerable progress has been made in the experiments with the supposedly hybrid *Basilarchias*, *B. proserpina* Edw. and *B. arthechippus* Scud. Their hybrid nature has now been proved by breeding experiments. The data obtained also support the conclusions drawn from earlier experiments, to the effect that in *proserpina* the black of *astyanax* is incompletely but uniformly dominant over the white-banded condition of *arthemis*.

O. A. JOHANNSEN: *Cocoon Making of Bucculatrix canadensisella.* Read by title.

J. G. NEEDHAM: *Some Adaptive Features of Myrmeleonid Venation.* Read by title.

E. H. STRICKLAND: *The Pezomachini of North America.* Read by title.

P. P. CALVERT: *Seasonal Collecting in Costa Rica.* Read by title.

Z. P. METCALF: *Homologies of the Wing Veins of Homoptera Auchenorrhynchi.* Read by title.

The following annual public address was given at the Cosmos Club, Wednesday evening, December 27:

J. H. COMSTOCK: *The Evolution of the Webs of Spiders.* Illustrated.

It is probable that the production of silk by spiders was not primarily evolved for the making of webs for capturing prey. The representatives of many families do not spin webs; and there is no reason to believe that these non-web-making families have descended from web-making forms. All spiders use silk in caring for their eggs; and it is probable that this was the primary use of silk in this group of animals.

Spiders having acquired silk for the protection of their eggs have utilized it for other purposes, of which the making of webs for capturing prey is but one, and probably not the next one in the sequence of the different uses of this substance. The acquiring of the habit of spinning a drag-line, the thread which most spiders spin wherever they go, doubtless preceded the making of webs. A spider spinning a drag-line would make a web if

by chance it moved about in a limited space as in some nook in which it had taken up its abode. In such a web insects would be trapped, and thus might arise the habit of building webs for the purpose of trapping insects. Many spiders spin simple irregular webs composed entirely of the drag-line silk. From this simple type was traced series of specializations leading to the different types of complicated webs. In the making of some of these several different kinds of silk are used.

The following officers were elected for the year 1912:

President—Stephen A. Forbes.

First Vice-president—A. D. Hopkins.

Second Vice-president—C. P. Gillette.

Secretary-Treasurer—Alex. D. MacGillivray.

Additional Members of Executive Committee: J. H. Comstock, J. B. Smith, Henry Skinner, Herbert Osborn, E. D. Ball, P. P. Calvert.

Member of Committee on Nomenclature—H. T. Fernald.

The society adjourned to meet with the American Association for the Advancement of Science at Cleveland, Ohio.

ALEX. D. MACGILLIVRAY,
Secretary-Treasurer

SOCIETIES AND ACADEMIES

THE ACADEMY OF SCIENCE OF ST. LOUIS

THE meeting of the Academy of Science of St. Louis was held at the Academy Building, Monday evening, January 15, 1912, President Engler in the chair. Dr. Arthur E. Ewing presented an illustrated account of *Sanninoidea exitiosa* (Say) and *Sanninoidea opalescens* (Hy. Edwards).

After describing the varieties of the *S. exitiosa* and the difference between them and the *S. opalescens*, giving the history of the insects and Beutenmüller's classification, examples were exhibited of the eggs on the bark of the tree, on the gum from the base of the tree, on leaves from the lower limbs of trees, and one on a trumpet vine leaf that grew a foot from the base of a tree, all of which were observed as they were laid and immediately collected, the collection having been made at the Mountainboro orchard, Mountainboro, Alabama, and at Gadsden, Alabama, between the first and the fifth of September, 1911. The exit of the larvæ from these eggs was observed to be from seven to nine days, the time of the one laid on the trumpet vine was eight days.

For four successive seasons the life period of

the insect had been carefully noted at Mountainboro, and it was found to confirm for northern Alabama the observations of Porter, Starnes and Sherman for Georgia and North Carolina, and shows that in the Southern Allegheny peach belt pupation begins about the first of August and the moth appears the last week in the same month. In 1908, August 4, as many full-grown borers were captured in this orchard of 15,000 trees as there were cocoons, the total number being 1,100; August 7, 300 cocoons were captured and as many borers destroyed. The same conditions obtained during the first week of August, 1909. In 1910 the investigation was made later and resulted in the finding of 8,500 cocoons between the 20th and the 24th of August and very few borers. Two hundred of the cocoons were placed in a wire cage on a southern covered porch. From these 25 moths emerged previous to September 5, 46 between the 5th and the 8th inclusive, 29 between the 9th and the 13th, and after this only two, one male the 16th and another the 21st. The remainder failed to develop.

Observations on the moths in the cage were that their activity depends greatly upon the temperature; with it below 70° F. they are very quiet, and very active when it is above 80° F. At night they sleep with their antennæ spread rather wide, some with the wings moderately spread, usually, however, with the wings near the body as when at rest, and the male with the tip of the abdomen strongly turned upward. When awake and alert the antennæ were erect and near together as if indicating the facial expression of the insect. At night they took no notice of an electric light right above them when it was turned on and off. Thus caged they lived only three or four days.

The 28th of August, 1911, fifty infested trees were examined. From the half of the cocoons the moths had escaped. During the examination only one borer was found which had not yet begun its cocoon. Throughout the orchard the moths were numerous, and in greater numbers from the 1st to the 5th of September. On September 13 only one moth was found, although a careful outlook was kept during the middle of the day, the time when the imago is most active.

An exhibition was made of the larvæ at numerous ages, from the emergence from the egg to the time of spinning the cocoon, together with an example of their destructive work on the tree, and numerous mounted examples of the male and female moth of the *S. exitiosa* type.

Also a cocoon was shown filled with the larvæ

of *Bracon mellitor* (Say), and others filled with the cocoons of this ichneumon, the parasite having been found in from one to two per cent. of the *S. exitiosa* cocoons examined.

Particular stress was laid upon the fact that only black and white drawings of the insects were given in the various state and national bulletins which were distributed throughout the country for the instruction of the orchardist, and lantern slides were shown from the plates of Beutenmüller in which there were at least 75 other examples of *Sesia*, which in black and white would readily be confused with this one by the laity. To be of any real value to the people all government bulletins dealing with insects should contain exact colored plates of the insect described in order to be intelligible to those not familiar with entomology. As an example, the owners and the foreman of the Mountainboro orchard did not know the *S. exitiosa* until they saw it emerge from the cocoon, although all of them had carefully read all the important government bulletins on the subject, particularly those of Slingerland, Marlatt and Starnes, and they had owned and cared for the orchard for more than ten years. As the moth flies only in mid-day, it was unquestionably often seen by them without being recognized.

GEORGE T. MOORE,
Corresponding Secretary

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

THE 455th regular meeting of the society was held October 24, in the new National Museum. The first paper read was by Mr. J. Mooney, on "Indian Survivals in the Carolinas."

He gave a brief account of his summer's work with the eastern Cherokee on their reservation in the mountains of western North Carolina, and with some mixed-blood survivors, locally known as Croatan Indians, in the eastern part of the state. The Eastern Cherokee, numbering about 2,000, are descendants of those who fled to the mountains when the body of the tribe was removed to the Indian Territory in 1838. They still retain most of their aboriginal customs and beliefs, together with their language, although the larger tribal ceremonies are nearly obsolete.

The Croatans, so-called from an attempt to identify them with Raleigh's lost colony of 1585, are centered chiefly in Robeson County, to the number of about 8,000 according to the last census, with bands in adjoining counties and in South Carolina. They appear to be descendants of the original native tribes of the same region, largely mixed

with alien blood, the Indian blood still predominative, although they have completely lost all knowledge of Indian customs, language or tribal names. They are intelligent and prosperous people, farmers and small tradesmen, fully up to the level of their white neighbors. They have official recognition from the state as Indians, with a separate school appropriation and support of a small paper called the *Indian Observer* devoted to their interests.

Mr. Hodge gave an exhibition and talk on the speech and civilization of the seventeenth and eighteenth centuries in New Mexico. Dr. P. Radin spoke on "Some Archeological Problems of the Winnebagoes." Dr. Hrdlička suggested that the physical anthropology of the skulls found in the Wisconsin mounds should be taken into consideration by the speaker.

THE 456th regular meeting of the society was held in the new National Museum, November 14. The speaker of the evening was Mr. W J McGee, on "Conditions Limiting the Growth of Population in United States." His talk was an elaboration of his paper in *SCIENCE* (October 6, 1911, pp. 428-435).

THE 457th regular meeting of the society was held in the new National Museum, January 16. The speaker was Dr. J. W. Fewkes, who lectured on the "Western Neighbors of the Prehistoric Pueblos," illustrating his remarks with lantern slides. The early Spanish discoverers, he said, designated the habitations of the sedentary Indians of the southwest by several names, as pueblos, casas grandes, rancherías and trincheras, the word pueblo being especially assigned to a compact several-storied community house of terraced form represented most abundantly along the Rio Grande River. The large houses on the Gila they called casas grandes, and they gave the name rancherías to fragile-walled dwellings made of brush and clay supported by logs. Defensive walls were sometimes called trincheras. Each of these names indicates distinct architectural types, although they were not used with accuracy. In late years it happens that all ruined buildings of the southwest, especially those independent of cliffs, are called pueblo ruins, the culture of the people that once inhabited them being designated the pueblo culture. It is well to preserve the term pueblo for the crowded-terraced many-storied buildings to which it was originally applied, and when this is done the distribution of the pueblo

type in our southwest is considerably restricted. The stone ruins ascribed to the ancient sedentary inhabitants of Arizona from the Upper Verde River west to the Colorado are not true pueblos. In this region there predominated massive stone forts of magnitude and fragile-walled houses with stone foundations, a duality everywhere evident. The indications are that both kinds of buildings were constructed and used simultaneously by the same people. The forts, situated on almost inaccessible hill tops, were asylums for safety, and more perishable buildings on the river terraces were habitations near aboriginal farms. The great number of these forts on the western border of the pueblo region implies a great necessity for defense along the whole western border of Arizona and Sonora in Mexico.

Dr. Fewkes gave a brief account of the different forts and terrace dwellings on the Upper Gila and its tributaries, Sycamore and Granite creeks, the Chino and Williamson valleys and Walnut Creek to the mouth of the Santa Maria and other tributaries of the Colorado, all examples cited substantially agreeing in the duality of architectural type and the absence of true pueblo structure.

The simple construction of the forts and the rude character of the masonry made of undressed stone, without mortar, was referred to. Views of the remains of dwellings or rancherias on the river terraces were shown and commented upon. Terrace sites indicated by rectangular and circular rows of stones and low mounds occur all along the Chino and Walnut valleys to Aztec Pass. These show no evidences of kivas or sacred rooms, or many-storied dwellings. The pottery found near them is rude, sometimes decorated; the pictography is characteristic; the people made extensive irrigation ditches.

The most important forts mentioned were those on the Upper Verde, near del Chino, and on the limestone ridge west of Jerome Junction. Two important forts (one situated near the mouth of Walnut Creek and the other at Aztec Pass, the latter being the "pueblo" first described by Wheeler) were referred to by the speaker. Maps of the Walnut Creek region are defective, the most prominent elevation, Mount Hope, being wrongly located on some of the latest issued by the land office. Big Burro and other streams west of Aztec Pass have forts overlooking enormous canyons of great scenic interest.

The geographical distribution of the forts and trincheras in western Arizona corresponds in a general way with the northern extension of the

Yuma stock, according to Major Powell's linguistic map. The country west of the Verde Valley in which the ruins occur was peopled by Yavapai, Hualapai, Havasupai, and other Indians called by Cortez, Apaches. The Havasupai, who now live in the depths of the Cataract Canyon, and the Hualapai are said to have legends that their ancestors constructed some of the buildings considered. The Hopi Indians dwelling in the pueblo Oraibi claim that certain of their clans came from the west and that they are of Yuma stock. The question of the kinship of the ancient builders is of interest to the physical anthropologist as well as to the linguist and student of culture history. As the Indians of the Yuman stock formerly extended to the Pacific, the possible kinship of the western neighbors of the pueblos to tribes of Southern California is significant.

Dr. Aleš Hrdlička in discussion said that the results of the direct study of man himself in the region west of the pueblos agree in a large part with the conclusions arrived at by Dr. Fewkes, but in part they also differ. It is quite possible that the region about and west to southwest of the Aztec Pass was once occupied by either the Mohave or Yuma. The people against whom they had to defend themselves, however, were more probably the Apaches. The Walapai and Suppai, who to-day speak the Mohave language, are physically Apache, and the same is true of the Yavapai. As the Apache type is a very distinct one, this conclusion is quite definite. Both tribes contain, of course, some Mohave and probably also Pueblo admixture.

Dr. Hrdlička showed a series of views of special Suppai and Walapai huts which are related to those of the Apache but which are totally distinct from those of the Mohave and Yuma, and numerous types of men and women from the several tribes, showing great resemblance between the Walapai and Suppai and the Apache, while the Mohave resemble much more closely the pueblos.

Mr. George Stetson then spoke on the Code of Hammurabi. His remarks showed how humanitarian the code was, and what an advance it was on Roman law in several respects, though antedating the latter by centuries. The speaker also demonstrated how the laws of various states of the union and certain foreign nations might well be advantageously amended on the lines of the code under discussion.

TRUMAN MICHELSON,
Secretary